VHF FM TRANSCEIVER

TK-780/H

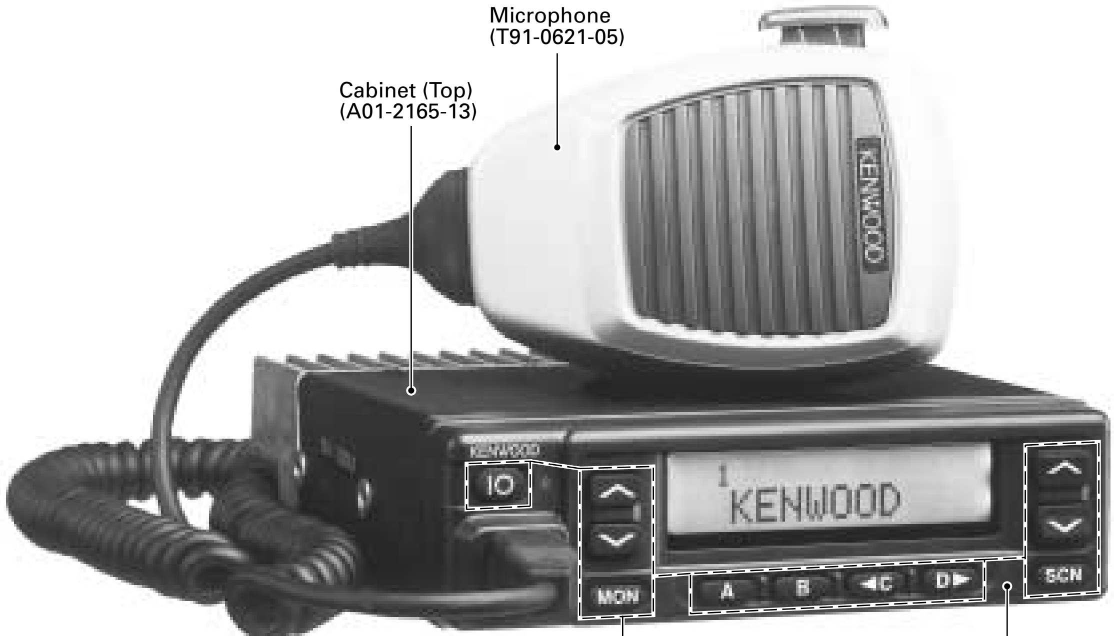
SERVICE MANUAL

SUPPLEMENT

KENWOOD

B51-8581-00 (N) 1370

This service manual applied to products with 30200001 or subsequent serial numbers.
In terms of the products with the serial numbers earier than 30200001, refer to the TK-780/H service manual as per part No. B51-8461-10.



CONTENTS

GENERAL

INTRODUCTION

SCOPE OF THIS MANUAL

This manual is intended for use by experienced technicians familiar with similar types of commercial grade communications equipment. It contains all required service information for the equipment and is current as of this publication date. Changes which may occur after publication are covered by either Service Bulletins or Manual Revisions, which are issued as required.

ORDERING REPLACEMENT PARTS

When ordering replacement parts or equipment information, the full part identification number should be included. This applies to all parts : components, kits, and chassis. If the part number is not known, include the chassis or kit number of which it is a part and a sufficient description of the required component, for proper identification.

PERSONNEL SAFETY

The following precautions are recommended for personnel safety :

- DO NOT transmit if someone is within two feet (0.6 meter) of the antenna.
- DO NOT transmit until all RF connectors are secure and any open connectors are properly terminated.
- SHUT OFF this equipment when near electrical blasting caps or while in an explosive atmosphere.
- All equipment should be properly grounded before power-up for safe operation.
- This equipment should be serviced by only qualified technicians.

PRE-INSTALLATION CONSIDERNATIONS

1. UNPACKING

Unpack the radio from its shipping container and check for accessory items. If any item is missing, please contact KENWOOD immediately.

2. LICENSING REQUIREMENTS

Federal regulations require a station license for each radio installation (mobile or base) be obtained by the equipment owner. The licensee is responsible for ensuring transmitter power, frequency, and deviation are within the limits permitted by the station license.

Transmitter adjustments may be performed only by a licensed technician holding an FCC first, second or general class commercial radiotelephone operator's license. There is no license required to install or operate the radio.

3. PRE-INSTALLATION CHECKOUT

3-1. Introduction

Each radio is adjusted and tested before shipment. However, it is recommended that receiver and transmitter operation be checked for proper operation before installation.

3-2. Testing

The radio should be tested complete with all cabling and accessories as they will be connected in the final installation. Transmitter frequency, deviation, and power output should be checked, as should receiver sensitivity, squelch operation, and audio output. QT equipment operation should be verified.

4. PLANNING THE INSTALLATION

4-1. General

Inspect the vehicle and determine how and where the radio antenna and accessories will be mounted.

Plan cable runs for protection against pinching or crushing wiring, and radio installation to prevent overheating.

4-2. Antenna

The favored location for an antenna is in the center of a large, flat conductive area, usually at the roof center. The trunk lid is preferred, bond the trunk lid and vehicle chassis using ground straps to ensure the lid is at chassis ground.

4-3. Radio

The universal mount bracket allows the radio to be mounted in a variety of ways. Be sure the mounting surface is adequate to support the radio's weight. Allow sufficient space around the radio for air cooling. Position the radio close enough to the vehicle operator to permit easy access to the controls when driving.

4-4. DC Power and wiring

1. This radio may be installed in negative ground electrical systems only. Reverse polarity will cause the cable fuse to blow. Check the vehicle ground polarity before installation to prevent wasted time and effort.
2. **You must connect the positive power lead directly to the positive terminal of the vehicle battery. Never connect the lead to any other positive power source, such as a cigarette lighter jack or fuse terminals.**

CAUTION

If DC power is to be controlled by the vehicle ignition switch, a switching relay should be used to switch the positive power lead. The vehicle ignition switch then controls DC to the relay coil.

3. **You must also connect the ground lead directly to the negative terminal of the vehicle battery.**
4. The cable provided with the radio is sufficient to handle the maximum radio current demand. If the cable must be extended, be sure the additional wire is sufficient for the current to be carried and length of the added lead.

GENERAL / OPERATING FEATURES

5. INSTALLATION PLANNING – CONTROL STATIONS

5-1. Antenna system

Control station. The antenna system selection depends on many factors and is beyond the scope of this manual. Your KENWOOD dealer can help you select an antenna system that will best serve your particular needs.

5-2. Radio location

Select a convenient location for your control station radio which is as close as practical to the antenna cable entry point. Secondly, use your system's power supply (which supplies the voltage and current required for your system). Make sure sufficient air can flow around the radio and power supply to allow adequate cooling.

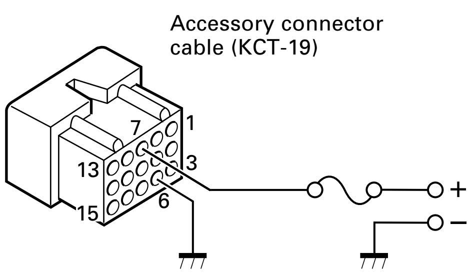
SERVICE

This radio is designed for easy servicing. Refer to the schematic diagrams, printed circuit board views, and alignment procedures contained in this manual.

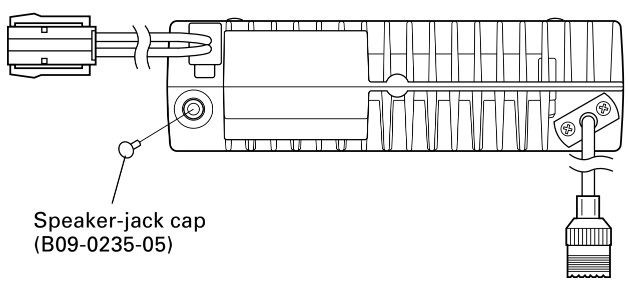
Note

When you modify your radio as described in system set-up, take the following precaution.

The rating of pin 7 (SB) of the accessory connector cable (KCT-19) on the rear of the radio is 13.6V (1A). Insert a 1A fuse if you use the SB pin for external equipment.



If you do not intend to use the 3.5-mm jack for the external speaker, fit the supplied speaker-jack cap (B09-0235-05) to stop dust and sand getting in.



1. Operation Features

The TK-780/780H is a VHF FM radio designed to operate in both trunking format (LTR model) and conventional format (Conventional model). The programmable features are summarized.

Model ─┬─ Trunking format ──┬─ Trunking mode
       └─ Conventional format └─ Conventional mode

1-1. Trunking Format

This format can handle up to 32 systems with up to 250 groups in each system. The transceiver can be used in both trunked mode and conventional mode. Systems, groups, and their functions are programmed.

1-2. Conventional Format

This format can handle up to 250 groups with 250 channels in each group. The transceiver can be used only in conventional mode. Groups, channels, and their functions are programmed.

2. Transceiver Controls and Indicators (Fig. 1)

2-1. Front Panel Controls

All the keys on the front panel are momentary-type push buttons. The functions of these keys are explained below.

- **POWER key**

  Transceiver POWER key. When the power is switched off, all the parameters, such as the system and group in trunking format, and the group and channel in conventional format, are stored in memory. When the power is switched on again, the transceiver returns to the previous conditions.

- **SYSTEM UP/DOWN key (Trunking format, programmable)**

- **GROUP UP/DOWN key (Conventional format, programmable)**

- **SCAN key (Programmable)**

- **MONITOR key (Programmable)**

- **A, B, C and D key (Programmable)**

- **VOLUME UP/DOWN key (Programmable)**

- **BUSY/TX LED**

  The BUSY indicator (Green LED) shows that the channel is in use. The TX indicator (Red LED) shows that you are transmitting.

OPERATING FEATURES

2-2. Programmable Keys

The FPU (KPG-49D) enables programmable keys to select the following functions.

■ Conventional format

AUX-A, AUX-B (Only when voice scrambler is not selected), Channel down, Channel up, DTMF ID (BOT), DTMF ID (EOT), Display character, Emergency (Only foot key), Function, Group down, Group up, Home channel, Horn alert, Key lock, Memory (RCL/STO), Memory (RCL), Memory (STO), Monitor A, Monitor B, Monitor C, Monitor D, Operator selectable tone, Public address, Redial, Scan, Scan del/add, Scrambler (Only when voice scrambler is selected), Talk around, Volume down, Volume up and None.

■ Trunking format

Auto tel, AUX-A, AUX-B (Only when voice scrambler is not selected), DTMF ID (BOT), DTMF ID (EOT), Display character, Emergency (Only foot key), Function, Group down, Group up, Home group, Horn alert, Key lock, Memory (RCL/STO), Memory (RCL), Memory (STO), Monitor A, Monitor B, Monitor C, Monitor D, Public address, Redial, Scan, Scan del/add, Scan temporary delete, Scrambler (Only when voice scrambler is selected), System down, System up, TEL disconnect, Volume down, Volume up and None.

These functions the FPU programs to the function keys and described in the following sections.

• Auto TEL (Trunking format)

Automatically connects available repeaters that are connected to telephone circuits when operating as LTR system. The time allocated to search for available repeaters is 60 seconds, after which connection failure occurs, a DTMF tone is output and the function terminates.

If connection to an available circuit is made, only ID 253, EOT or hang-up time-out can terminate the function.

• AUX-A

If this key is pressed, “AUX” icon lights on the LCD and AUX port which is inside of the transceiver turns to the high level. If pressed again, the “AUX” icon goes off and the AUX ports turns to the lower level.

• AUX-B

This function can be programmed when the voice scrambler board is not installed.

If this key is pressed, an underscore (“_”) appears at the extreme right of the LCD and AUX port which is inside of the transceiver turns to the active level. If pressed again, the underscore disappears and the AUX ports turns to the deactive level.

• Channel up/down (Conventional format)

When the key is pressed each time, the channel number to be selected is incremented/decremented and repeats if held for one second or longer. This key works as the voice scrambler code selector in the voice scrambler code select mode.

• DTMF ID (BOT)

In conventional mode, if you press this key, a predetermined DTMF ID (Begin of TX) will be sent automatically.

• DTMF ID (EOT)

In conventional mode, if you press this key, a predetermined DTMF ID (End of TX) will be sent automatically.

• Display character

This key switches the LCD display between the system and group number in trunking format and the group and channel name in conventional format.

• Emergency

Pressing this key for longer than the programmed “Emergency Key Delay Time” causes the transceiver to enter the emergency mode. The transceiver jumps to the programmed “Emergency system and group in trunking format and the group and channel in conventional format” and transmits for the programmed “Active Time”.

The transceiver disables mic mute while transmitting. After finishing transmission, the transceiver receivers for the programmed “Interval Time”. The transceiver mutes the speaker while receiving. Following the above sequence, the transceiver continues to transmit and receive.

• Function

Pressing this key causes the transceiver to display “FCN”. Then, pressing a microphone DTMF key causes the corresponding programmed function to start. This key may be convenient when using many functions with the microphone 12-key keypad.

• Group up/down

When the key is pressed each time, the group number to be selected is incremented/decremented and repeats if held for one second or longer.

• Home channel (Conventional format)

Press this key once, the channel switches to the pre-programmed home channel.

• Home group (Trunking format)

Each pressing of the key selects a preset system/group.

• Horn alert

If you are called from the base station using 2-tone/DTMF while you are away from your transceiver, you will be alerted by the vehicle horn or some other type of external alert. To turn the horn alert function on , press this key. A confirmation tone sounds, and the display shows “HA” on the sub LCD.

If this key is pressed again, the horn alert function is turned off.

• Key lock

Pressing this key causes the transceiver to accept entry of only the [Function], [Key lock], [PTT], [Monitor A], [Monitor B], [Monitor C], [Monitor D], and [Emergency] keys.

OPERATING FEATURES

- **Message mode**

Press this key to enter the message mode. (See "Alphanumeric Two-way Paging Function" for details)

- **Memory**

This key allows DTMF memory data to be recalled; up to 32 memories each with a memory dial of up to 16 digits and an A/N of up to 10 digits per memory.

- **Monitor**

Used to release signalling or squelch when operating as a conventional. It is also used to reset option signalling.

- **Operator selectable tone (Conventional format)**

This key switches the pre-set decode QT/DQT and encode QT/DQT to OST (Operator Selectable Tone) tone pair.

Press this key, the transceiver enters to OST select mode. In this mode, the display shows "OFF" and the operator can select one of the OST tone pair using the group up/down key. The display shows "TONE✳✳" and tone pair No. ✳✳ is selected.

Press OST key again, the transceiver exits from the OST select mode, and returns to the group/channel mode with the handset indicator (✆). The handset indicator (✆) means that the OST tone pair is selected. OST tone pair number or OFF can be memorized for each channel.

16 kinds of tone pair for OST can be programmed by KPG-49D. OST is useful to access the repeater with same radio frequency and different tone (QT/DQT).

- **Public address**

Public address amplifies the microphone audio, and outputs it through a PA speaker. PA is activated by pressing this key. A confirmation tone sounds, and the display shows "PUBLIC ADRS". PA can be activated at anytime (scanning or non-scanning).

The RADIO continues to scan & receive calls while in PA mode. Pressing PTT activates PA, and will override an incoming call at anytime; however, no RADIO transmission takes place.

If this key is pressed again, a confirmation tone will sound, the display will return to the normal channel or SCAN display, and the PA function will turn off.

- **Redial**

If you press this key when the system/group (Trunking format) or group/channel (Conventional format) is displayed, the last transmitted DTMF code will appear on the display. Pressing the PTT switch at this time will transmit the displayed DTMF code.

- **Scan**

Press this key starts scanning. Pressing this key stops scanning.

- **Scan del/add**

1) Trunking format

Used to select whether system scan routines are used during system scan. Each pressing of the key (to ON) toggles between lockout and lock. The scan routine is started when on lock. The DEL indicator flashes when the system is on lockout.

2) Conventional format

This key switches the currently displayed channel between "Delete" and "Add".

The "Add" channel contained in the scan sequence, and "Delete" channel is not contained. In the scan mode, this key switches the channnel delete or add temporarily.

- **Scan temporary delete (Trunking format)**

This key is temporarily deleted a system being scanned. If you press this key when scan is stopped (when a call is being received from another station), the system is temporarily deleted and scanning restarts.

This key operates even when "Scan Type" is set to "List Type System Scan".

- **Scrambler**

If a scrambler code (1 to 16) has been set in the FPU, an underscore ("_") appears at the extreme right of the LCD display when scrambler is active. Pressing this key changes on/off of scramble operation. Press this key for 2 seconds to enter scrambler code selection mode.

- **Send GPS (Optional)**

Pressing this key causes the transceiver to send a single GPS data. (GPS receiver must be installed.)

- **System up/down (Trunking format)**

When the key is pressed each time, the system number to be selected is incremented/decremented and repeats if held for one second or longer.

- **Talk around (Conventional format)**

Press this key, the transceiver uses the receive frequency and the tone for transmission.

The operator can call the other party directory (without repeater). Press this key again, the talk around function goes off.

- **Telephone disconnect (Trunking format)**

Pressing this key ends an RIC connection (disconnects the telephone line).

- **Volume up/down**

When the key is pressed, the volume level is increased/decreased and repeats if held for 200ms or longer.

- **None**

Sounds error operation beep, and no action will occur. Use this function when the transceiver is required to be more simple operated.

OPERATING FEATURES

2-3. Front Panel Displays and Indicators

① Sub display

Displays the system, channel and group numbers. Also displays various functions, such as TA.

② P (Priority) indicator

The P indicator (P) appears when a selected channel is programmed as priority, in conventional operation.

③ MON (Monitor) indicator

The MON indicator appears when the button programmed as MONITOR is pressed.

④ SVC (Service) indictor

This icon is not used this transceiver.

⑤ SCN (Scan) indicator

The SCN indicator appears when using scan mode.

⑥ AUX (Auxiliary) indicator

appears when the auxiliary function is activated (ON) by pressing the AUX-A key.

⑦ Handset indicator

The handset indicator (☎) appears when the selected group is programmed as telephone IDs (Trunking format).

In conventional format, the handset indicator (☎) appears when the OST tone pair is selected.

⑧ MAIL indicator

Flashes when a status message (FleetSync™) is received. Lights when a status message is stored in the stack memory.

⑨ Alphanumeric display

The twelve-character dot matrix alphanumeric display shows the system/group numbers. You can program system/group names with up to ten characters in place of these numbers. The left display is used as a delete indicator (▶) and the right is used for the selective call (∗) or scrambler (_) function. The delete indicator shows the systems locked out of the scanning sequence. Selective call and scrambler are optional functions that can be programmed.

Dispalys received messages when using FleetSync™.

⑩ A,B,C,D key

These keys are programmable function (PF) keys.

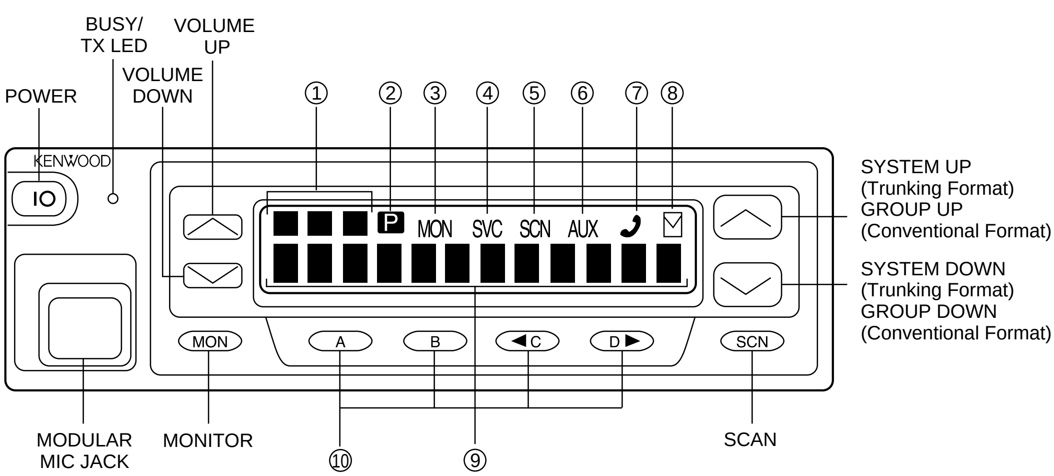


Fig. 1

3. Scan Operating

3-1. Trunking Format

■ System scan

System scan can be selected with the "Scan" key by programming the scan feature. When the "Scan" key is pressed and the "SCN" mark appears, scan mode in entered. Scanning starts from the system following the currently displayed system. When a call is received, scanning stops, and the system and group are displayed.

When programming key is touched during scanning, the scan stops and the revert system or group can be changed. Scanning resumes one second after the key is released.

There are two types of system scan.

- **Fix system scan**

All the set systems except locked-out ones are scanned. If the Del/Add feature is assigned to the programmable key, it can be controlled from the front panel.

- **List type system scan**

A scan list can be set for each system.

The list to be scanned can be changed by changing the display system.

If many systems have been set, the scan speed can be increased by narrowing the systems to be scanned with scan lists.

OPERATING FEATURES

■ System lockout

The system lockout feature is used to lock systems out of the scan sequence, and can be selected by programming in the following two ways;

• Fixed lockout

The system to be locked out is selected by programming. When a locked system is selected, the Delete (▶) indicator appears on the left of the SYSTEM indicator. The revert system is scanned even if it is locked out. If there is a locked system, the Delete (▶) indicator flashes during fixed scanning.

• User selectable lockout

If the scan lockout feature is programmed to a key, the user can lock systems out of the scan sequence with the key. To lock a system out of the scan sequence, press the key when the system is displayed. The Delete (▶) indicator is displayed on the left of the SYSTEM indicator.

To unlock a system, select the system and press the key. The Delete (▶) indicator disappears to indicate that the system has returned to the scan sequence. The revert system is scanned even if it is locked out. If there a locked system, the Delete (▶) indicator flashes during fixed scanning. If all systems are locked out, the scan stops and only the revert system is received.

■ Drop-out delay time (Scan resume time)

If a call is received during scan, the scan stops. The scan resume time can be programmed as 0 to 300 seconds in one-second increments. The default value is 3 seconds.

■ Dwell time

The dwell time is the time after transmission ends until the scan resumes in scan mode. It can be set 0 to 300 seconds by programming. The default value is 3 seconds.

■ System/group revert

System/group revert can be programmed for one of the following;

• Last called revert

The system or group changes to the revert system or group when a call is received with the system or group being scanned.

• Last used revert

If a system/group call is received during scanning and the PTT button is pressed for transmission and response within the drop out delay time, the system or group is assigned as the new revert system or group.

• Selected revert

If the system/group was changed while scanning, the newly selected system/group.

• Selected + Talkback revert

If the system/group was changed while scanning, the newly selected system/group. The transceiver "talks back" on the current receive group.

■ Scan massage wait

The time for staying with the home repeater that receives a signal during system scan and monitoring data messages can be programmed. If there is no signal from the home repeater, the system is scanned for about 50ms. If there is a signal, three data messages are monitored. Normally, three data messages are monitored for each system, and it can be increased in multiples of three data messages per line to up to eight lines.

If the repeater data message indicates that there is no call, data monitoring is terminated and the home repeater of the next system is scanned.

■ Group scan operation

Group scan can be programmed for each group. In addition to the ID codes of the selected group, the ID codes of the other groups that are permitted for group scan are decoded. (The two fixed ID and block decode codes are always decoded.)

If, during group scanning, a call is received with one of the selectable group ID codes for which group scan is enabled, the group display indicates the group number that the call came in with. That group then becomes the new selected group. Group scan resumes after the specified drop-out delay time or dwell time shared by the system scan elapses.

■ In conventional system

If QT or DQT is set for the channel, the channels, including signalling, are scanned.

In case of the priority group is set in conventional system, if a group scan (including group scan during a system scan) temporarily stops (receiving) in a group that does not have priority, a look back is performed to the priority group. Look back is performed according to the look back time A and B settings. If a call is received on the priority group, reception immediately switches to the priority group.

3-2. Conventional Format

■ Scan types

• Single group scan

You can scan all valid (ADD) channels in the displayed group that can be selected with the group up/down key.

• Multiple group scan

You can scan all valid (ADD) channels in the all valid (ADD) group.

OPERATING FEATURES

■ SCAN start condition

One or more non-priority channels must be added to all channels that can be scanned. The transceiver must be in normal receive mode (PTT off).

When you activate the key programmed to the scan function, the scan starts. The scan icon "SCN" lights and "–SCAN–" or revert channel (programmable) is indicated on alphanumeric display.

■ Scan stop condition

The scan stops temporarily if the following conditions are satisfied.

1) A carrier is detected, then signalling matches on channels for which receive the signalling is set by the programming software.
2) A carrier is detected on the channels for which receiving signalling is not set by the programming software or when the monitor (signalling cancel) function is activated.

■ Scan channel types

1) Priority channel is the most important channel for the scan, and always detects a signal during scan and when the scan stops temporarily.
2) Non-priority channels detects a signal during scan. For the channels that can be selected with the group or channel up/down key when the scan does not occur, adds an indicator "▼" lights.

■ Priority channel setting

A priority channel can be set as follows with the programming software (KPG-49D).

1) Specify a priority channel as a fixed priority channel.
2) Make a selected channel, a priority channel.

■ Scan type according to the priority channel

1) When no priority channel is set : Only the non-priority channels are scanned.
   If a non-priority channel stops temporarily, it stops until there is no signal on the channel.
2) When priority channel is set : Either priority channel is scanned.
   If a non-priority channel stops temporarily, a priority channel signal is detected at certain intervals.
   If a priority channel stops temporarily, it stops until there is no signal on the priority channel.

■ Revert channel

The revert channel is used to transmit during scanning and set by the programming software (KPG-49D).

1) Priority
   The transceiver reverts to the priority channel.
2) Priority + talkback
   The transceiver reverts to the priority channel.
   If you press PTT during a resume timer (dropout delay time, TX dwell time) or calling, you can transmit on current channel to answer to the call however revert channel is set to priority channel.
   After resume time, scan re-starts and transmission channel is return to priority channel.
3) Selected channel
   The transceiver reverts to the channel before scanning or the channel that you changed during scan.
4) Last called channel
   The transceiver reverts to the last called channel during the scan.
5) Last used channel
   The transceiver reverts to the last used (transmitted) channel during scan. "Last used" revert channel includes talkback function.
6) Selected + talkback
   The transceiver reverts to the channel before scanning or the channel that you changed during scan.

■ Scan end

When you reactivate the key programmed to the scan function during scan mode, the scan ends.

The scan icon "SCN" and "–SCAN–" or revert channel (programmable) display goes off.

■ Temporarily delete/add

It is possible to delete or add channel temporarily during scan. When scan stops on unnecessary channel for example by interference of the other party, activate the delete/add function (for example press the key), then that channel is deleted temporarily and scan re-start immediately.

When you would like to add the deleted channel temporarily to scan sequence, select the desired (deleted) channel during scan, activate the delete/add function (for example press the key) before scan re-start.

That channel is added temporarily to scan sequence. The temporary deleted or added channels are returns to pre-set delete/add, when the transceiver exits from scan mode.

4. Details of Features

4-1. Common Trunking format and Conventional Format

■ Time-out timer

The time-out timer can be programmed in 15 seconds increments from 15 seconds to 10 minutes. If the transmitter is keyed continuously for longer than the programmed time, the transmitter is disabled and a warning tone sounds while the PTT button is held down. The alert tone stops when the PTT button is released.

OPERATING FEATURES

■ Sub LCD display

You can use 3-digit the display to display the system number, channel number or group number. It is useful when the main (12-digit) display indicates system, group or channel name or other functions.

■ Selective call alert LED

You can select whether or not the LED on the transceiver flashes in an orange color when selective call was occurred.

■ PTT ID

PTT ID provides a DTMF or MSK (FleetSync™ : Fleet-ID) ANI to be sent with every time PTT (beginning of transmission, end of transmission, or both).

You can program PTT ID for each group. You can program a PTT ID as "on" or "off" when "DTMF" is selected for the PTT ID type. You can program a PTT ID as "own", "sel" or "off" when "MSK" is selected for the PTT ID type. The contents of ID are programmed for each transceiver.

The timing that the transceiver sends ID is programmable.

BOT : DTMF ID (BOT)/MSK ID is sent on beginning of transmission.

EOT : DTMF ID (EOT)/MSK ID is sent on end of transmission.

Both : DTMF ID (BOT)/MSK ID is sent on beginning of transmission and DTMF ID (EOT)/MSK ID is sent on end of transmission.

■ Radio password

When the password is set in the transceiver, user can not use the transceiver unless enter the correct password.

This code can be up to 6 digits from 0 to 9 and input with the key, and "S" key.

■ Off hook decode

If the Off hook decode function has been enabled, removing and replacing the microphone on the hook has no effect for decoding QT/DQT and option signalling.

■ Timed power off

This function works as "Automatic Power Switch Off".

Timed power off timer starts from the ignition-off. After the timer expires, the radio will automatically turn off. The timer will be reset if the ignition is turned on and off.

This function requires ignition-sense. Connect the ignition-line to the 9-pin connector which is located at the rear of the radio.

After the timer expires, press the power switch to turn on the radio.

■ Horn alert

In trunking format, horn alert can be set to on or off for each group. If horn alert has been set to YES for a group and DEC ID/QT/DQT matches, the horn alert, HOR. is turned on and off. The group for which the optional signalling is set works by ANDing the decode ID/QT/DQT with the optional signalling.

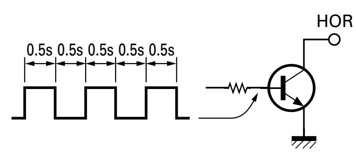
In conventional format, if you are called from the base station using 2-tone/DTMF while you are away from your transceiver, you will be alerted by the vehicle horn or some other type of external alert. To turn horn alert function on, press the [Horn Alert] key.

Either continuous or non-continuous operation can be set by the FPU. The horn alert port is enabled or disabled as follows;

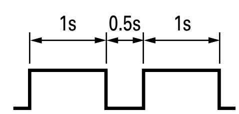
Off hook horn alert	Hook off	Hook on
Enable	Yes	Yes
Disable	No	Yes

■ Pulse

The horn alert port, HOR, is turned on and off as follows;



The timing when the fixed LTR ID matches is as follows (trunking format);



■ Continuous

Horn alert can be reset by setting an expiration time from the FPU, pressing the AUX-A key, or setting off hook.

■ Data TX with QT/DQT

Whether programmed QT/DQT is modulated or not with a data transmission except for Selcall. A radio unit can receive a data message regardless of QT/DQT if the receiving unit is not scanning.

OPERATING FEATURES

4-2. Trunking Format

■ Call indicator

The call indicator can be programmed for each group. In trunked system, it can be set to respond to a selectable decode ID or one of two fixed IDs, except block IDs. When a call is received with a selectable decode ID, the call indicator flashes. When a call is received with a fixed ID, the call indicator lights continuously.

On a conventional system, the call indicator can be programmed to light for each QT or DQT code. It keeps flashing while a call is being received. It is turned off by pressing any front panel key.

■ Free system ringback

This feature is available only when a telephone interconnected ID code is selected. If a busy tone sounds when the PTT button is pressed, the transceiver enters this mode automatically.

When the PTT button is released, a beep sounds for 400ms to indicate that the mode has been entered. If the scan is on, it is resumed (the "SCN" mark goes on). When any repeater becomes available, a ringing tone sounds and this mode ends.

The mode is terminated when the system, group, scan, PTT, key is changed.

■ System search

This feature can be programmed to automatically access other programmed systems when the selected system cannot be accessed. If an intercept tone sounds when the PTT button is pressed after setting the mode, the transceiver has entered the mode.

If the group ID is a telephone interconnect ID, the transceiver then attempts to access, in succession, other systems that have a telephone interconnect ID in the revert group location. If the group ID is a dispatch ID, the transceiver attempts to access other systems that have a dispatch ID programmed in the revert group location.

If there is no system to be accessed, an intercept tone sounds, the mode is terminated, and the transceiver returns to the first system. If the access is successful, the mode is terminated, and the searched system becomes the new selected system (If during scanning, the scan stops).

■ Transpond

This feature can be programmed to turn on and off for each group. If the ID of the group for which transpond is enabled is received, two data messages (transmit ID and turn-off code) are automatically transmitted if the PTT button is not pressed as a response within the time set (0 to 300 seconds in 1-second increments). If the PTT button is pressed within the time, the transpond is not preformed.

■ Transmit inhibit

The transceiver can be programmed with a transmit inhibit block of ID codes. If an ID code within this block is decoded the preset time before the PTT button is pressed, transmission is inhibited. The BUSY indicator lights and a busy tone sounds until the PTT button is released to indicate that transmission is not possible (except clear-to talk mode).

Transmission with the group for which the encode ID is not set is inhibited, and the busy tone is output while the PTT button is held down, regardless of the clear-to talk setting.

■ Auto TEL

A telephone interconnect call can be made by simply pressing the key by assigning this feature to the key. This feature accesses the TEL channel of the available system automatically.

When the key is pressed, a queue tone is output, and the “AUTO TEL” appears on the alphanumeric display along with a flashing handset indicator (✆) to indicate that this mode has been entered. If the TEL ID is set for the revert system, the TEL channel of that system is accessed. If all TEL channels are busy, an attempt is made to access the TEL channels of another system in which the TEL ID code has been programmed. It is repeated for 60 seconds until the access succeeds. If the access succeeds, a dial tone returns from the repeater. If the key is pressed again when the queue tone is sounding, this mode is canceled.

If the access fails after 60 seconds, a deny tone is output and this mode is terminated. When the talk ends, the revert system/group returns. When the scan mode is effective, the scan resumes. The Auto TEL feature can be programmed to turn on or off for each system.

■ ARQ mode

It affects Trunking mode only. Automatic Repeat reQuest (ARQ) mode is a manner to minimize the air traffic of data communication. Also, it enables to occupy the trunking repeater channel fot the data communication period.

4-3. Conventional Format

■ “TOT” pre-alert

The transceiver has “TOT” pre-alert timer. This parameter selects the time at which the transceiver generates “TOT” pre-alert tone before “TOT” is expired.

“TOT” will be expired when the selected time passes from a TOT pre-alert tone.

■ “TOT” re-key time

The transceiver has “TOT” re-key timer. This timer is the time you can not transmit after “TOT” exceeded. After “TOT” re-key time expired you can transmit again.

OPERATING FEATURES

■ "TOT" reset time

The transceiver has "TOT" reset timer. This timer is the minimum wait time allowed during a transmission that will reset the "TOT" count.

"TOT" reset time causes the "TOT" to continue even after PTT is released unless the "TOT" reset timer has expired.

■ OST (Operator Selectable Tone)

The transceiver is capable to have "OST" function and 16 tone pair (QT/DQT) with max 10-digit name for each tone pair.

■ "OST" back up

The transceiver is programmable the selected "OST" code is memorized or not. If you set to Disable (no memorized), the "OST" function always starts at "off".

■ Direct "OST"

It is possible to call "OST" number directory using keypad. In this case, keypad is used for "OST", then auto "PTT" store and send functions by keypad are not usable.

■ Clear to transpond

The transceiver waits the transpond of 2-tone /DTMF if channel is busy until channel open. This feature prevents the interference to other party.

5. Option Signalling

5-1. DTMF/2-Tone

Built-in DTMF decoder is available for option signalling.

Built-in 2-tone decoder is available for option signalling.

It is possible to use individual call, group call, D.B.D. (Dead Beat Disable). D.B.D. is used with DTMF only.

If the option signalling matches, a predetermined action will occur.

If option signalling matches on a group/channel which is set up with option signalling, the option signalling indicator (✱) will flash and option signalling will be released. The transpond or alert tone will sound.

If the selective call alert LED is set up, the orange LED will flash.

While option signalling matches (or if option signalling is deactivated when you are transmitting), you can mute or unmute ID/QT/DQT/Carrier.

■ AND/OR

You can select AND or OR for option signalling match conditions.

	Alert/Transpond
AND	QT/DQT/ID+DTMF (2-tone); Option matches = Action
OR	QT/DQT/ID+DTMF (2-tone); Option matches = Action
	AF mute open
AND	QT/DQT/ID+DTMF (2-tone); Option matches = Action
OR	QT/DQT/ID; Signalling only matches = Action

With OR set up, alert/transpond will not function with only DTMF (Trunking format).

With OR set up, AF mute will not release when only DTMF matches.

With a conventional channel not set up with QT or DQT, only the carrier is considered when signalling matches.

■ Auto Reset

If option signalling matches a group set up with option signalling, option signalling is released. After matching option signalling, option signalling will temporarily reset automatically.

■ Dead Beat Disable

If the D.B.D. code matches, a predetermined action will occur. Whether option signalling is activated or not, when D.B.D. matches on any channel, the transceiver will become TX inhibited or TX/RX inhibited. While D.B.D. is active, if the D.B.D. code + "#" code is received, D.B.D. will disactivate.

When D.B.D. matches, transpond will function. Alert will not be output, and option signalling match icon will not appear.

5-2. MSK

Built-in MSK (FleetSync™ : Fleet-ID) decoder is available for option signalling. When the group ID/Carrier matches, squelch remains muted while the station waits for reception of proper MSK signal. When MSK signal matches, squelch unmutes.

■ AND/OR

AND : QT/DQT/ID + MSK to unmute. MSK matches = alert tone

OR : QT/DQT/ID to unmute. MSK matches = alert tone

6. Alphanumeric Two-way Paging Function (FleetSync™)

■ General

The Alphanumeric Two-way Paging Function (FleetSync™) is a KENWOOD proprietary protocol. It enables a variety of paging functions.

■ ID Construction

A radio unit ID is defined by a combination of 3-digit Fleet and 4-digit ID numbers. Each radio unit must be assigned its own Fleet and ID numbers.

■ PTT ID

A pre-programmed unique ID (own) can be sent at the beginning of transmission and/or the end of transmission to identify which radio unit is on air.

When selecting (sel) for MSK ID, the radio calls the specific Fleet user the same as selective call.

OPERATING FEATURES

■ Selective Call (SELCALL)

This is a voice call to a particular individual or group of stations.

• Example of call types;

[100][ALL] : <Group Call>
All the units whose fleet number is “100” are called.
[100][1000] : <Individual Call>
The unit, whose the fleet number is “100” and ID number is “1000”, is called.
[ALL][ALL] : <Broadcast Call>
All the units are called.
[ALL][1000] : <Supervisor Call>
All ID “1000” are called regardless of their fleet number.

• Unit ID encode block

Encode ID Block can be set to limit manual dial ID. The radio unit will not accept an ID other than these IDs which are entered from the keypad. If Inter-fleet Call is enabled, block ID setting affects each fleet group.

■ Status Message

Using a 2-digit number, you can send and receive a Status message which may be decided in your talk group. Each Status may be displayed with 16 alphanumeric characters if programmed in the radio. A maximum of 9 received messages can be stored in the stack memory, and it can be reviewed after reception. If the message memory becomes full, the oldest one will be erased. The stack memory will be cleared by turning radio power off.

• Status 80~99 (Special)

Status numbers from 80 to 99 are reserved for special purposes. Entering these statuses from the DTMF keypad can be inhibited.

Please notice that the following status numbers are used for special purposes;

80~87 : Reserved for future use.
88 : Terminates to emergency mode.
89 : Request for horn alert.
90 : Remote stun on. Disable the received radio unit’s TX.
91 : Remote stun on. Disable the received radio unit’s TX/RX.
92 : Cancel remote stun. Enable the received radio unit’s TX/RX.
93 : Acknowledgement status sent when the radio unit is in stun mode (TX disabled).
94 : Acknowledgement status sent when the radio unit is in stun mode (TX/RX disabled).
95~97 : Reserved for future use.
98 : Man down emergency status (For portable).
99 : Emergency status.

Note : Remote stun works with DTMF D.B.D. function also.

• Automatic status response

If you pre-select a status number and leave the radio in the Status Mode, it can automatically respond with the selected status number upon request from the base station. (The request function is initiated by serial control on the base station (Optional).)

■ Short Message (Optional)

A maximum of 48 characters can be sent (External equipment is required). Received Short Messages will be displayed in the same manner as a Status Message. A maximum of 4 received messages can be stored in the stack memory. In the Stack Mode, 3-digit LCD indicates the received Short Message as “M01”~”M04".

■ Long Message (Optional)

A maximum of 1024 characters can be sent (External equipment is required). Received Long Message will not be displayed or stacked in the radio memory but is output through the COM (Data) port.

■ Emergency Function

Emergency status 99 will be sent at the beginning of each emergency transmission.

• Emergency status response

Either “Horn” or “Alert” can be selected for the called radio unit’s response to reception of status 99 which is used as an emergency status.

■ Other Functions

• Manual dial

Fleet, ID and Status numbers can be entered from DTMF keypad. (DTMF microphopne is required.)

• FleetSync™ baud rate

MSK data baud rate setting. The same rate must be set as a communication partner.

1200bps :
Data communication is made in 1200bps. The communication area is much wider than 2400bps. Recommended for repeater operation.
2400bps :
Data communication is made in 2400bps. The communication area is narrower than 1200bps, but it will decrease the data traffic. Data rate 2400bps may not work properly depending on the repeater’s characteristic.

• Message mode timer

Message Mode Timer is a delay timer returning from message/stack mode to Normal mode.

• Status/short/long message on data group/channel

Status/Short/Long Message transmission is made whether on the Data System/Group in trunking format and on the Data Group/Channel in conventional format.

OPERATING FEATURES

- **Status/short/unit ID message serial output (Option)**

  Whether a received Status/Short message or PTT ID is output or not from serial port.

- **Caller ID display**

  PTT ID is displayed on LCD.

- **Call alert (Continuous)**

  The radio can provide the alert tone repeatedly until next operation.

- **PTT ID sidetone**

  This function allows a single beep sound after the PTT ID (MSK) for FleetSync™ signalling is encoded.

- **Caller ID stack**

  The radio stores the last 3 received caller IDs to volatile memory.

■ GPS Report (Optional)

ANMEA-0183 GPS unit must be installed.

- **GPS report mode**

  GPS data can be sent automatically or upon request. Manually sending GPS data works regardless of this setting.

  Auto : GPS data is sent both automatically and by request. GPS Auto TX Interval and GPS Time Mark must be adjusted if required.
  Poll : GPS data is sent upon request from dispatcher.

- **GPS report interval**

  Interval time between automatic GPS data transmissions.

- **GPS time mark (Per mobile)**

  The amount of time from the 0 (zero) minute of the standardized GPS UTC time to starting the first transmission of GPS data. It must be set to a different value for each radio unit to avoid a transmission crash.

- **Send GPS**

  Pressing this key causes the transceiver to send a single GPS data.

- **GPS report on data group/channel**

  GPS data transmission is made on the Data System/ Group in trunking format and on the Data Group/Channel in conventional format.

- **Received GPS data output**

  Any selected sentence can be output through the radio serial port (COM1 or COM0).

1) MAP HEADER NMEA1 ($GPGGA), NMEA2 ($GPGLL), NMEA3 ($GPRMC)
   NMEA-0183 standard command. This should be set according to your PC application.

2) MAP HEADER KW1 ($PKLDS)
   This is a Kenwood original sentence which consists of "$GPGLL + Fleet + ID + Status". This item should be set according to your PC application.

3) MAP HEADER KW2 ($PKLID)
   This is a Kenwood original sentence which consists of "Fleet + ID". This should be set according to your PC application.

■ Parameters

- **GTC count**

  Number of Go To data Channel messages to be sent before transmitting a data message if it is being made on Data System/ Group. If a radio unit receives a GTC message, it will move to the Data System/Group of the current system. Increase this item to make sure the called radio unit moves to the Data System/Group in trunking format and the Data Group/Channel in conventional format.

- **Random access (Contention)**

  When a channel (or all the repeater channels for Trunking mode) is busy, radio unit will not transmit (depending on its Busy Channel Lockout setting in conventional mode). As soon as a channel is cleared, some transmissions may crash. Random access is used to avoid this by employing a random transmission sequence.

- **Number of retries**

  Number of Retries is the maximum number of retry transmission when no acknowledgement is received in the Maximum ACK Wait Time. Increase this item to improve data communication reliability.

- **TX busy wait time**

  TX Busy Wait Time is the maximum amount of time before giving up the data transmission when the channel (or all the repeater channels for Trunking mode) is busy. Also, this timer affects if it expires during Random Access period.

- **Maximum ACK wait time**

  Maximum ACK Wait Time is the maximum amount of time to wait for an acknowledgement from the called radio unit. It is used as an interval time of retries. It must be set greater than the ACK Delay Time of the called radio unit.

OPERATING FEATURES

- **ACK delay time**

ACK Delay Time is the amount of time from the end of receiving a data to the beginning of sending an acknowledgement. It should be adjusted as the repeater's hang-up delay time. Also, it must be set less than the Maximum ACK Wait Time of the calling radio unit.

- **TX delay time (RX capture)**

TX Delay Time is the amount of unmodulated transmission to let the called unit stop scanning or exit its battery save mode. It is used only when starting a data communication sequence.

- **Data TX modulation delay time**

Data TX Modulation Delay Time is the amount of time from the beginning of transmission to the beginning of a data modulation. It is used every time data is transmitted. It must be set to more than 300ms if data communication is made in Trunking Mode.

7. Audible User Feedback Tones

The transceiver outputs various combinations of tones to notify the user of the transceiver operating state. The main tones are listed below.

The high tone is 1477Hz, the mid tone is 941Hz, and the low tone is 770Hz.

■ Power On Tone

This tone is output when the transceiver is turned on. (The high tone is output for 500ms.)

■ Alert Tone

This tone is output when the transceiver is TX inhibition for TOT, battery warning and PLL unlocked. It is output until the PTT button is released.

■ DBD On Tone

When a D.B.D. code is received, transpond tone sounds.

■ DBD Off Tone

When a D.B.D. release code is received, transpond tone sounds.

■ Password Agreement Tone

When the correct password is entered, the tone sounds. The optional feature's control tone can be set to yes or no.

■ PTT Release Tone

When you release the PTT switch, the PTT release tone sounds.

■ Busy Tone

Sounds in LTR mode, when you cannot use a repeater (system busy or TX inhibit). Sounds in conventional mode, when busy channel lockout is functioning. You can select yes or no for the optional feature's warning tone.

■ Group Call Tone

Sounds when a group call with the correct DTMF/2-tone option signalling is received, repeats 7 times. You can select yes or no for the optional feature's warning tone.

■ Individual Call Tone

Sounds when an individual call with the correct DTMF/2-tone option signalling is received. You can select yes or no for the optional feature's warning tone.

■ Key Press Tone [A]

Sounds when a key is pressed. For toggle keys, sounds when toggle function is turned on (key press tone [B] sounds when it is turned off). You can select yes or no for the optional feature's control tone.

■ Key Press Tone [B]

Sounds when a key is pressed. For toggle keys, sounds when the toggle function is turned off (key press tone [A] sounds when it is turned on). You can select yes or no for the optional feature's control tone.

■ Key Press Tone [C]

Sounds when a key is pressed. Also sounds when storing data, adding a DTMF code to memory, and when changing test mode settings. You can select yes or no for the optional feature's control tone.

■ Key Input Error Tone

Sounds when a key is pressed but that key cannot be used. You can select yes or no for the optional feature's warning tone.

■ Roll Over Tone

Sounds in Trunking format at the smallest system/group. Sounds in Conventional format at the smallest group/channel. You can select yes or no for the optional feature's control tone.

■ Transpond Tone

Sounds when an individual call with the correct LTR/DTMF/2-tone option signalling is received. For group calls, only the group tone will sound, not the transpond tone.

■ Intercept Tone (Trunking Format)

This tone indicates that the transceiver is out of range. It indicates that the PTT button is pressed, and transmission has started, but the repeater cannot be connected and talking is not possible. It is output until the PTT button is released. (The mid tone and low tone are output alternately in 200ms intervals.)

OPERATING FEATURES / REALIGNMENT

■ Delay Tone (Trunking Format)

This tone is output when the PTT button is pressed and the repeater is accessed three times or more to indicate connection with the repeater is delayed. This tone is the same as the busy tone. (It is not output of clear to talk has been set to yes.)

■ Proceed Tone (Trunking Format)

This tone is output when the PTT button is pressed, transmission starts, and the repeater is connected to indicate that the user can talk if the clear to talk function has been set. (The high tone is output for 100ms.)

■ Queue Tone (Trunking Format)

This tone is output until the auto TEL function is set and the TEL channel is accepted successfully. (The mid tone on for 50ms, off for 50ms, and on for 50ms in 1 second intervals.)

■ Deny Tone (Trunking Format)

This tone is output if the auto TEL function is set, the queue tone is output, but the TEL channel cannot be accessed within 60 seconds. It is similar to the intercept tone. (The mid tone and low tone are output alternately in 150ms intervals.)

■ Free System Ringback Mode Tone, System Search Mode Tone (Trunking Format)

This tone indicates that the transceiver is free system ringback mode or system search mode. (The mid tone is output for 400ms.)

■ Ringing Tone (Trunking Format)

This tone indicates that the transceiver can use the repeater in free system ringback mode. (The mid tone and no tone are output eight cycles alternately in 50ms intervals.)

■ System Search Tone (Trunking Mode)

Sounds when the system changes during system search. You can select yes or no for the optional feature's warning tone.

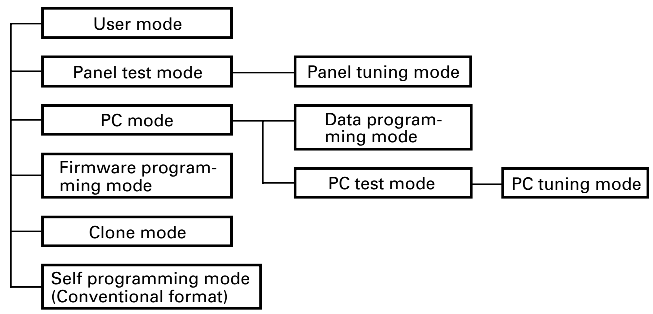
■ System Search End Tone (Trunking Mode)

Sounds when a possible connection to a repeater in system search is not mode. You can select yes or no for the optional feature's warning tone.

■ Pre Alert Tone (Conventional Format)

Sounds prior to the TOT TX inhibit activation. If TOT pre alert is set, the tone sounds at the amount of time programmed, before the TOT expires (TOT time – TOT pre alert time = Pre alert tone sounding time). You can select yes or no for the optional feature's warning tone.

1. Modes



Mode	Function
User mode	For normal use.
Panel test mode	Used by the dealer to check the fundament characteristics.
Panel tuning mode	Used by the dealer to tune the radio.
PC mode	Used for communication between the radio and PC (IBM compatible).
Data programming mode	Used to read and write frequency data and other features to and from the radio.
PC test mode	Used to check the radio using the PC. This feature is included in the FPU. See panel tuning.
Firmware programming mode	Used when changing the main program of the flash memory.
Clone mode	Used to transfer programming data from one radio to another.
Self programming mode (Conventional format)	Frequency, signalling and features write to the radio.

2. How to Enter Each Mode

Mode	Operation
User mode	Power ON
Panel test mode	[A]+Power ON (Two seconds)
PC mode	Received commands from PC
Panel tuning mode	[Panel test mode]+[SCN]
Firmware programming mode	[SCN]+Power ON (Two seconds)
Clone mode	[C]+Power ON (Two seconds)
Self programming mode (Conventional format)	[D]+Power ON (Two seconds)

3. Panel Test Mode

Setting method refer to ADJUSTMENT.

4. Panel Tuning Mode

Setting method refer to ADJUSTMENT.

REALIGNMENT

5. PC Mode

5-1. Preface

The TK-780/780H transceiver is programmed by using a personal computer, programming interface (KPG-46) and programming software (KPG-49D).

The programming software can be used with an IBM PC or compatible. Figure 1 shows the setup of an IBM PC for programming.

5-2. Connection Procedure

1. Connect the TK-780/780H to the personal computer with the interface cable.
2. When the Power switch on, user mode can be entered immediately. When PC sends command the radio enter PC mode, and "PROGRAM" is displayed on the LCD.
   When data transmitting from transceiver, the red LED is blinking.
   When data receiving to transceiver, the green LED is blinking.

Notes :

- The data stored in the personal computer must match model type, when it is written into the flash memory.
- Change the TK-780/780H to PC mode, then attach the interface cable.

5-3. KPG-46 Description (PC programming interface cable : Option)

The KPG-46 is required to interface the TK-780/780H to the computer. It has a circuit in its D-subconnector (25-pin) case that converts the RS-232C logic level to the TTL level.

The KPG-46 connects the modular microphone jack of the TK-780/780H to the computers RS-232C serial port.

5-4. Programming Software Description

The KPG-49D programming disk is supplied in 3-1/2" disk format. The software on this disk allows a user to program TK-780/780H radio via programming interface cable (KPG-46).

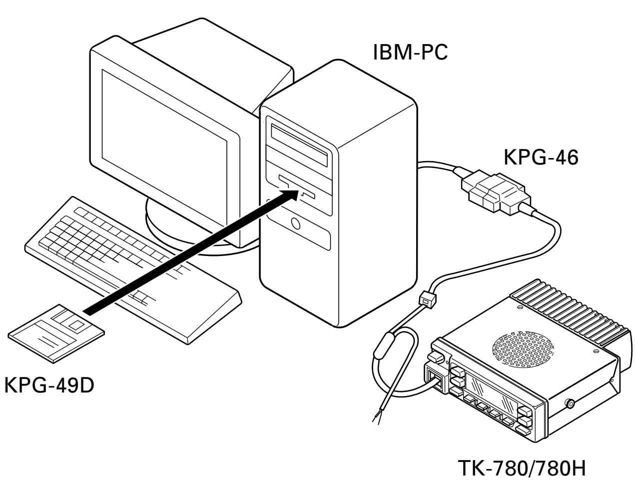


Fig. 1

5-5. Programming With IBM PC

If data is transferred to the transceiver from an IBM PC with the KPG-49D, the destination data (basic radio information) for each set can be modified. Normally, it is not necessary to modify the destination data because their values are determined automatically when the frequency range (frequency type) is set.

The values should be modified only if necessary.

Data can be programmed into the flash memory in RS-232C format via the modular microphone jack.

KPG-49D instruction manual parts No. : B62-1096-XX.

6. Firmware Programming Mode

6-1. Preface

Flash memory is mounted on the TK-780/780H. This allows the TK-780/780H to be upgraded when new features are released in the future. (For details on how to obtain the firmware, contact Customer Service.)

6-2. Connection Procedure

Connect the TK-780/780H to the personal computer (IBM PC or compatible) with the interface cable (KPG-46). (Connection is the same as in the PC Mode.)

6-3. Programming

1. Start up the programming software (KPG-49D), select "firmware program" in the "Program" item, and press the Return key on the personal computer. This starts up the firmware programmer.
2. The top screen is displayed. Press any key to advance to the next screen.
3. Set the communications speed (normally, 57600 bps) and communications port in the Setup item.
4. Set the firmware to be updated by File select (=F1).
5. Turn the TK-780/780H Power ON with the [SCN] switch held down. Hold the switch down for two seconds until the display changes to "PROG 57600". When "PROG 57600" appears, release your finger from the switch.
6. Check the connection between the TK-780/780H and the personal computer, and make sure that the TK-780/780H is in the Program mode.
7. Press F10 on the personal computer. A window opens on the display to indicate progress of writing. When the TK-780/780H starts to receive data, the [P] icon is blinking.
8. If writing ends successfully, the LED on the TK-780/780H lights and the checksum is displayed.
9. If you want to continue programming other TK-780/780H, repeat steps 5 to 8.

REALIGNMENT

Notes :

- To start the Firmware Programmer from KPG-49D, the FPRO path must be set up by KPG-49D setup.
- This mode cannot be entered if the Firmware programming mode is set to Disable in the Programming software (KPG-49D).
- When programming the firmware, it is recommend to copy the data from the floppy disk to your hard disk before update the radio firmware.
  Directly copying from the floppy disk to the radio may not work because the access speed is too slow.

6-4. Function

1. If you press the [MON] switch while "PROG 57600" is displayed, the checksum is displayed. If you press the [MON] switch again while the checksum is displayed, "PROG 57600" is redisplayed.
2. If you press the [D] switch while "PROG 57600" is displayed, the display changes to "PROG 19200" to indicate that the write speed is low speed (19200 bps). If you press the [D] switch again while "PROG 19200" is displayed, the display changes to "PROG 38400", and the write speed becomes the middle speed (38400 bps). If you press the [D] switch again while "PROG 38400" is displayed, the display returns to "PROG 57600".

Note :

Normally, write in the high-speed mode.

7. Clone Mode

Programming data can be transferred from one radio to another by connecting them via their modular microphone jacks. The operation is as follows (the transmit radio is the master and the receive radio is a slave).

1. Turn the master TK-780/780H power ON with the [C] key held down. If the password is set to the TK-780/780H, the TK-780/780H displays "CLONE LOCK". If the password is not set, the TK-780/780H displays "CLONE MODE".
2. When "CLONE LOCK" is displayed, only the [System up/down] key (Trunking format), the [Group up/down] key (Conventional format) and [SCN], and [0] to [9] keys can be accepted. When you enter the correct password, and "CLONE MODE" is displayed, the TK-780/780H can be used as the cloning master. The following describes how to enter the password.
3. How to enter the password with the microphone keypad. If you press a key while "CLONE LOCK" is displayed, the number that was pressed is displayed on the TK-780/780H. Each press of the key shifts the display in order to the left. When you enter the password and press the [SCN] key, "CLONE MODE" is displayed if the entered password is correct. If the password is incorrect, "CLONE LOCK" is redisplayed.
   How to enter the password with the [System up/down] key (Trunking format), the [Group up/down] key (Conventional format);
   If the [System up/down] key (Trunking format), the [Group up/down] key (Conventional format) is pressed while "CLONE LOCK" is displayed, numbers (0 to 9) are displayed flashing. When you press the [SCN] key, the currently selected number is determined, and the display shifts to the left. If you press the [SCN] key after entering the password in this procedure, "CLONE MODE" is displayed if the entered password is correct. If the password is incorrect, "CLONE LOCK" is redisplayed.
4. Power on the slave TK-780/780H.
5. Connect the cloning cable (No. E30-3382-05) to the modular microphone jacks on the master and slave.
6. Press the [S] key on the master while the master displays "CLONE MODE". The data of the master is sent to the slave. While the slave is receiving the data, "PROGRAM" is displayed. When cloning of data is completed, the mater displays "END", and the slave automatically operates in the User mode. The slave can then be operated by the same program as the master.
7. The other slave can be continuously cloned. When the [S] key on the master is pressed while the master displays "END", the master displays "CLONE MODE". Carry out the operation in step 4 to 6.

Note :

Only the same models can be cloned together.

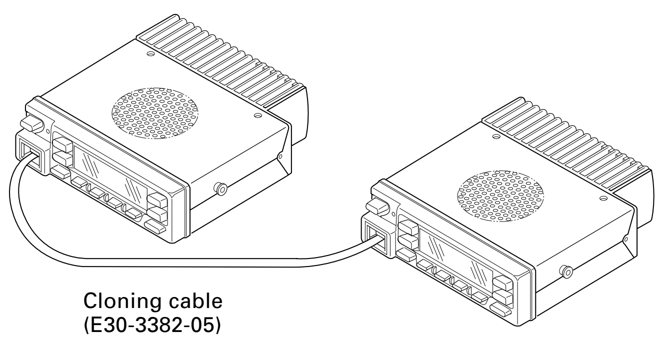


Fig. 2

REALIGNMENT

8. Self Programming Mode

Write mode for frequency data and signalling etc. Mainly used by the person maintaining the user equipment.

8-1. Enter to the Self Programming Mode

Delete R614 (SELF, Figure 3) in the TX-RX unit (B/2) and turn the power switch on while pressing the [D] key. When enter the self programming mode, “SELF PROG” is displayed.

Note :

This mode (self programming mode) cannot be set when it has been disabled with the FPU.

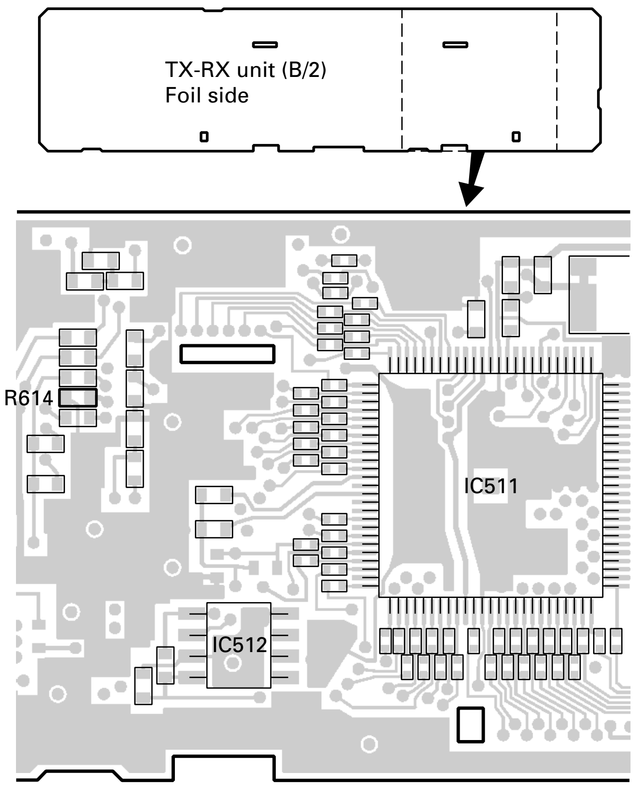


Fig. 3

9. Channel Setting Mode

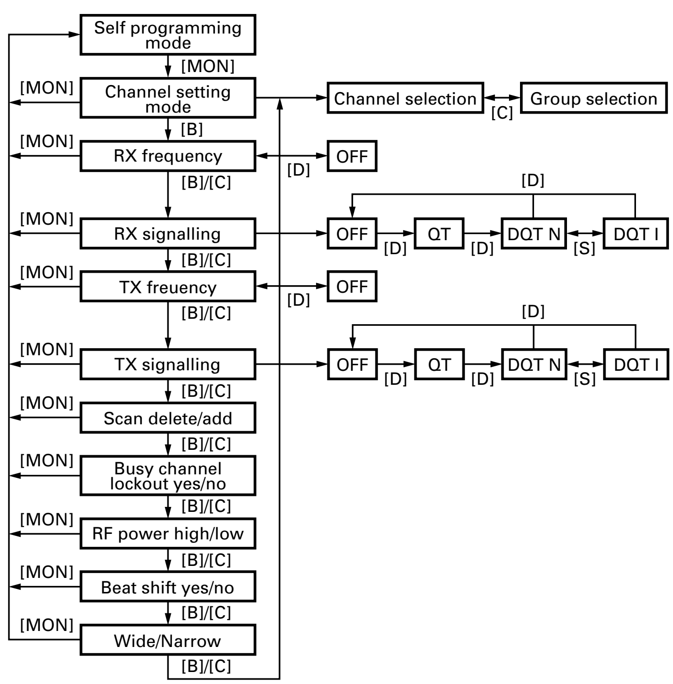
Each channel can be setup in its action mode by using the panel keys.

- Pressing [MON] while “SELF PROG” is displayed will change to channel setting mode.
- Press [C] to select a setup item, then press [GRP up/down] to change the selection.
- By pressing [B], the displayed information is stored in memory, and the next item appears. By pressing [C], the displayed information is not stored in memory, and the next item appears.
- Press [MON] to return to the original display (“SELF PROG”).

The setup items fro channel setting mode are listed below.

Setup function	Display (3 character)	Remarks
Channel selection	CH or GRP	
RX frequency	RXF	[D] : Switches frequency on/off
		[A] : Changes the step value between 2.5kHz, 5kHz, 6.25kHz, 7.5kHz, and 1MHz
RX signalling	RXS	[D] : Switches between off, QT, and DQT.
		[A] : Switches between 1 step and standard
		[SCN] : Switches between DQT normal and invert
TX frequency	TXF	Same as RX frequency
TX signalling	TXS	Same as RX signalling
Scan del/add	SCN	Delete/Add
Busy channel lockout	BSY	Yes/No
RF power	PWR	High/Low
Beat shift	SFT	Yes/No
Wide/Narrow	W/N	Wide/Narrow

9-1. Flow Chart



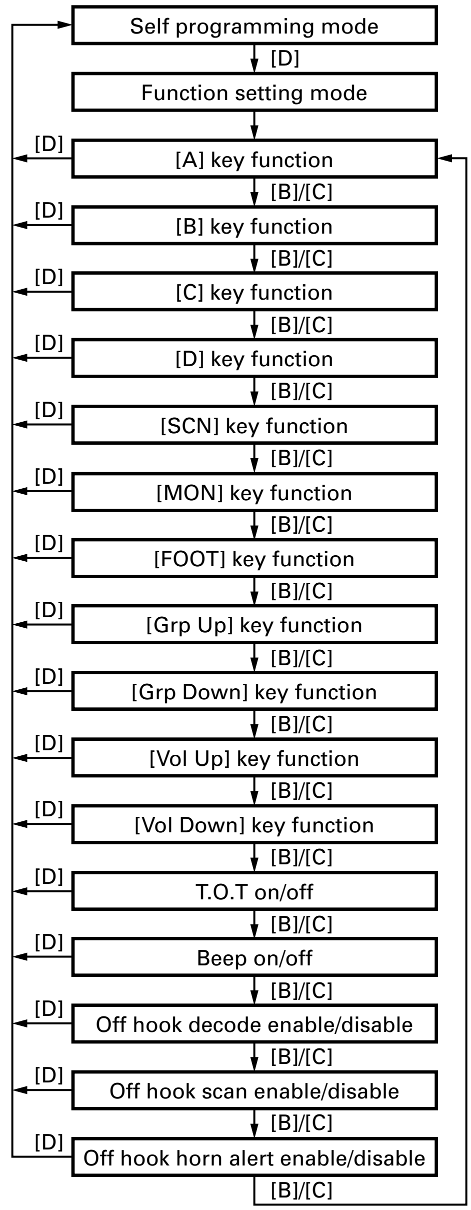
10. Function Setting Mode

All channels can be set up together in the action mode by using the panel keys.

- Pressing [D] while "SELF PROG" is displayed will change to function setting mode.
- Press [C] to select a setup item, then press [GRP up/down] to change selection.
- By pressing [B], the displayed information is stored in memory and the next item appears. By pressing [C], the displayed information is not stored and the next item appears.
- Press [D] to return to the original display ("SELF PROG"). The setup items for function setting mode are listed below.

Setup function	Display (3 character)	Remarks
[A]	A	Various key functions
[B]	B	Various key functions
[C]	C	Various key functions
[D]	D	Various key functions
[SCN]	SCN	Various key functions
[MON]	MON	Various key functions
[FOOT]	FSW	Various key functions
[Grp Up]	UP	Various key functions
[Grp Down]	DN	Various key functions
[Vol Up]	V UP	Various key functions
[Vol Down]	V DN	Various key functions
T.O.T	TOT	All TOT settings are turned on or off. On : TOT [60s]/Pre-alert [10s]/ Rekey time [5s]/Reset time [5s] Off : TOT [600s]/Pre-alert [Off]/ Rekey time [Off]/Reset time [Off]
Beep	BEP	All beep settings are turned on or off. On : Power on tone [On]/Control tone [On]/Warning tone [On] Off : Power on tone [Off]/Control tone [Off]/Warning tone [Off]
Off hook decode	H_D	Enable/Disable
Off hook scan	H_S	Enable/Disable
Off hook horn alert	H_H	Enable/Disable

10-1. Flow Chart



11. Memory Reset Mode

You can clear all settings you made in self programming mode, or you can return to the original display.

- Press [SCN] while "SELF PROG" is displayed will change the display to "CLEAR NO?".
- Press [GRP up/down] to change the display between "CLEAR NO?" and "CLEAR YES?".
- When "CLEAR YES?" is displayed, pressing [SCN] will set all data to default, and "ALL CLEAR" will appear on the display. Press [SCN] again to display "SELF PROG".
- When "CLEAR NO?" is displayed, pressing [SCN] will cancel the reset, and "SELF PROG" will be displayed.

INSTALLATION

1. Accessory Connection Cable (KCT-19 : Option)

The KCT-19 is an accessory connection cable for connecting external equipment. The connector has 15 pins and the necessary signal lines are selected for use.

1-1. Installing the KCT-19 in the transceiver

1. Remove the upper and lower halves of the transceiver case, and lift the DC cord bushing (❶) from the chassis.
2. Remove the pad as shown in Figure 1 (❷).
3. Insert the KCT-19 cable (❸) into the chassis (❹). The wire harness band (❺) must be inside the chassis.
4. Replace the DC cord bushing (❻).
5. Connect the KCT-19 to the TX-RX unit (A/2) as shown in Figure 2 (❼).
6. Connect the KCT-19 to the external accessory by inserting the crimp terminal (❽) into the square plug (❾), both of which are supplied with the KCT-19.

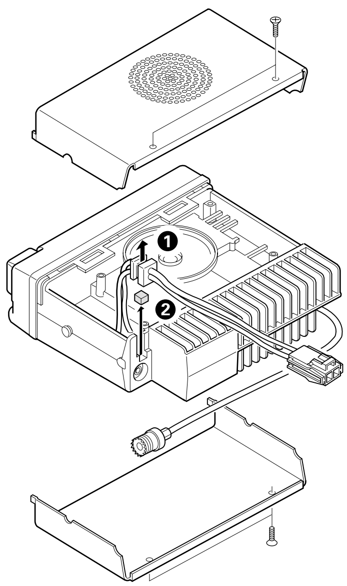


Fig. 1

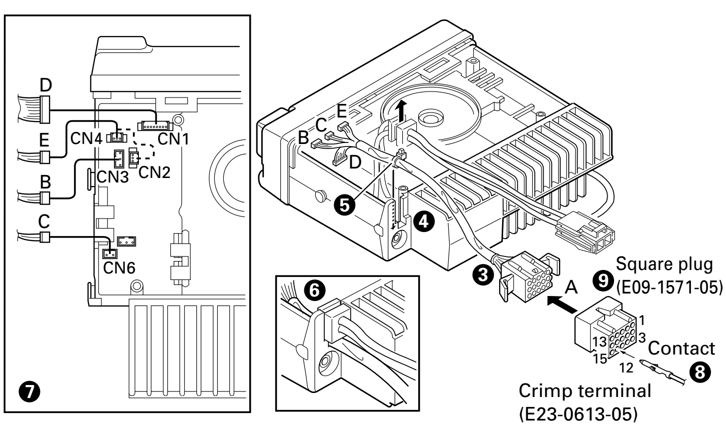


Fig. 2

1-2. KCT-19 Accessory Port Function

No. (A)	No. (B,C,D,E)		Name	Function	Note
1	D-2		AHK	External hook input	*1
			BUSY	System busy output	
2	D-5		ME	Microphone ground	*1
			AM	Speaker audio mute input	
3	D-3		IGN	Ignition sense input	
4	D-1		DEO	Receiver detector output	
5	D-6		MI	External microphone input	*1
			TXS	Transmitter sense output	
6	B-2		E	Ground	
7	B-3		SB	Switched B+, DC 13.6V output. Maximum 0.75A	
8	D-7		PTT	External PTT input, active low. During DTC is low, it works as DATA PTT.	
9	D-4		DI	Data modulation input	
10	B-1		HOR	Horn alert/call output	
11	D-8		SQ	Squelch detect output (Conventional)/ Logic squelch output (LTR).	
12	C-1		SP	Speaker audio output.	
13	E-1	CN2 and CN4	LOK	Link complete pulse output.	*1 *2
		CN2	AM	Speaker mute input.	
14	E-2	CN4	RXD	Serial control data input	*2
		CN2	MM	MIC mute input, active high.	
15	E-3	CN4	TXD	Serial control data output.	*2
		CN2 *1	DTC	Data control channel signal input, Data channel : Low	
			LOK	Link complete pulse output..	
			TXS	Transmitter sense output, Active high	
			FSW	Foot switch input, active low	

Note

*1 : The functions of A-1, A-2, A-5, A-13 (when connector E is connected to CN2), and A-15 (when connector E is connected to CN2) are changed as described in the jumper chart.

*2 : The functions of A-13, A-14 and A-15 are changed if the connector E is connected to CN2 or CN4 of the radio.

No.	CN2	CN4
E-1	LOK/AM	LOK
E-2	MM	RXD
E-3	LOK/DTC/TXS/FSW	TXD

· Connect CN6 of the radio to connector C of the KCT-19 instead of to the internal speaker connector, if use external speaker.

INSTALLATION

1-3. Data Equipment Connection

The jumpers must be set to either one for each function. Otherwise, the radio will not work properly.

AHK/BUSY

R64 (0Ω)	R18 (0Ω)	Function	
Yes	No	BUSY	System busy output indicates if no repeater channel is available in the currently selected LTR system when PTT is pressed, active low : Default
No	Yes	AHK	MIC hook input.

ME/AM

R12 (0Ω)	R167 (0Ω)	Function	
Yes	No	AM	Speaker mute input, active high : Default
No	Yes	ME	MIC ground.

MI/TXS

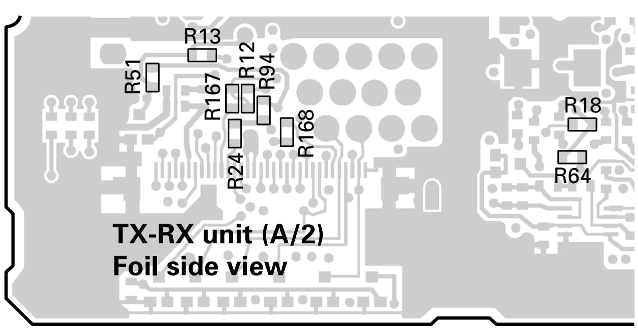
R94 (0Ω)	R24 (0Ω)	Function	
Yes	No	TXS	Transmitter sense output, active high : Default
No	Yes	MI	Internal MIC input.

LOK/AM

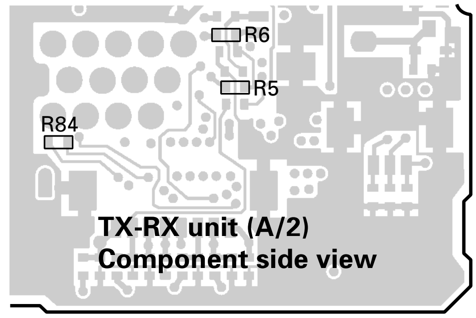
R5 (0Ω)	R6 (0Ω)	Function	
Yes	No	AM	Audio mute signal input.
No	Yes	LOK	Link complete pulse output : Default

DTC/LOK/TXS/FSW

R168 (0Ω)	R84 (0Ω)	R51 (0Ω)	R13 (0Ω)	Function	
No	No	No	Yes	LOK	Link complete pulse output.
Yes	No	No	No	DTC	Data control channel signal input, Data channel : low (Default)
No	No	Yes	No	TXS	Transmitter sense output, active high
No	Yes	No	No	FSW	Foot switch input, active low



TX-RX unit (A/2)
Foil side view



TX-RX unit (A/2)
Component side view

Note : The following parts are not installed at the time of shipping; R5,R13,R18,R24,R51,R84,R167

2. Accessory Terminal

2-1. Terminal Function

Connector No.	Pin No.	Pin name	I/O	Function
CN1	1	DEO (DO)	O	Detect signal output. (Output level : 250mVrms; standard modulation)
	2	AHK (AH)	I	External hook signal input. "COM2" port must be select "AUX HOOK/PTT" / "DATA PTT" function in the KPG-49D. On hook : L, Off hook : H
		BUSY	O	System busy signal output for trunking system. No vacant repeater : L, Vacant repeater : H
		RXD2	I	Serial data input 2. "COM2" port must be select "REM" / "DATA" / "DATA+GPS" function in the KPG-49D.
	3	IGN (IG)	I	Ignition input for KCT-18.
	4	DI	I	External modulation signal input.
	5	ME	–	MIC earth.
		AM	I	Audio mute signal input.
	6	MI	I	Internal MIC input.
		TXS	O	Signal indicating whether the transceiver is transmitting or not. TX : H, Another : L
	7	PTT (PT)	I	External PTT signal input. "COM2" port must be select "AUX HOOK/PTT" / "DATA PTT" function in the KPG-49D. TX : L, Another : H
		TXD2	O	Serial data output 2. "COM2" port must be select "REM" / "DATA" / "DATA+GPS" function in the KPG-49D.

INSTALLATION

Connector No.	Pin No.	Pin name	I/O	Function
	8	SQ	O	Squelch signal output. Signal logic type can select "Carrier operate relay" or "Tone operate relay". Active logic level or type can select in the KPG-49D.
CN2	1	AM	I	Audio mute signal input.
		LOK	O	Access logic signal output. Active level or type can be selectable in the KPG-49D.
	2	MM	I	MIC mute input.
	3	DTC	I	Data control channel signal input. Data channel : L, Normal channel : H
		TXS	O	Signal indicating whether the trans-ceiver is transmitting or not. TX : H, Another : L
		FSW	I	Foot switch signal input. Foot sw on : L, Foot sw off : H
		LOK	O	Access logic signal output. Active level or type can be selectable in the KPG-49D.
CN3	1	HOR	O	Horn alert signal output. Signal output for horn relay drive (open collector). L level during horn drive : Max. sink current 100mA.
	2	E	–	Earth.
	3	SB	O	Power output after power switch (DC 13.6V±15%, 0.75A max.).
CN4	1	LOK	O	Access logic signal output. Active level or type can be selectable in the KPG-49D.
	2	RXD1	I	Serial data input 1. "COM1" port must be select "REM" / "DATA" / "GPS" / "DATA+GPS" function in the KPG-49D.
	3	TXD1	O	Serial data output 1. "COM1" port must be select "REM" / "DATA" / "GPS" / "DATA+GPS" function in the KPG-49D.
CN5	1	PA	O	Relay for PA function in KAP-1 control signal. PA on : H, PA off : L
	2	SPO	O	Audio signal input from KAP-1.
	3	SPI	I	Audio signal output to KAP-1.
CN6	1	SP	O	Output for internal/external speaker.
	2	E	–	Earth.

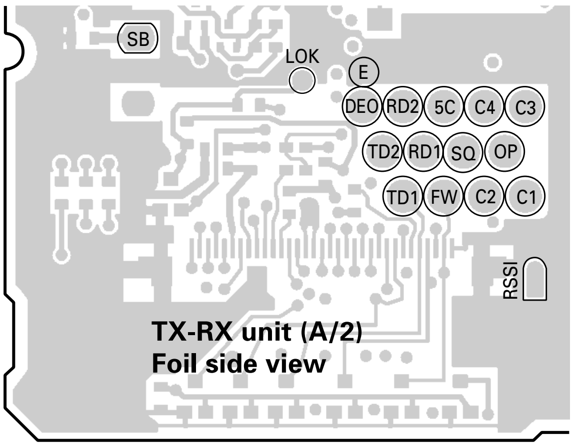
3. Optional Board Terminal

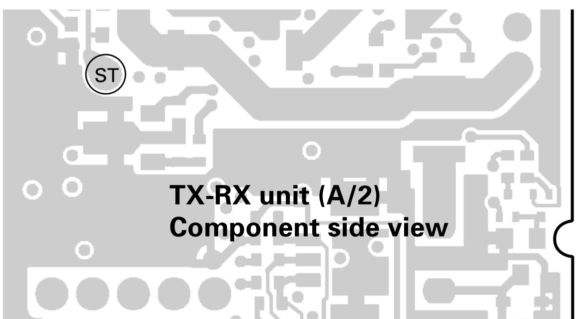
Terminal is for mounting the option board are provided at the TX-RX unit (A/2) and TX-RX unit (B/2). The table below shows the correspondence between the board and terminals. Disconnect R529 and R571 in TX-RX unit (B/2) when the scrambler board is attached.

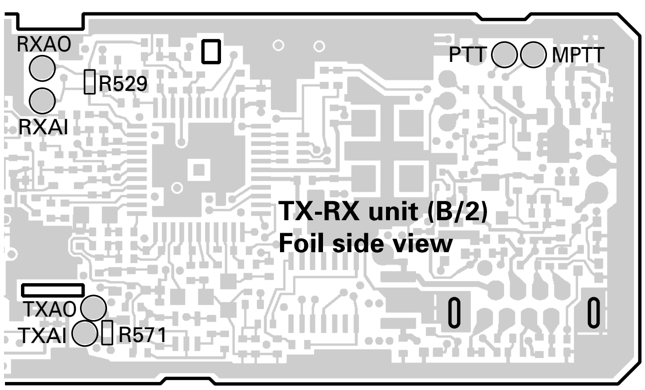
The table below shown the differences between the schematic terminals and the PC board terminals.

Schematic diagram			PC board view	
Name	I/O	Function	Name	Unit
SB	–	Switched B+, DC 13.6V output. Maximum 0.75A	SB	TX-RX (A/2)
5C	–	5C	5C	TX-RX (A/2)
GND	–	Earth	E	TX-RX (A/2)
DEO	O	Detect signal output (Output level : 250mVrms; standard modulation)	DEO	TX-RX (A/2)
RXAI	I	RX audio input	RXAI	TX-RX (B/2)
RXAO	O	RX audio output	RXAO	TX-RX (B/2)
TXAI	I	TX audio input	TXAI	TX-RX (B/2)
TXAO	O	TX audio output	TXAO	TX-RX (B/2)
LOK	O	Access logic signal output. Active level or type can be selectable in the KPG-49D.	LOK	TX-RX (A/2)
OPT (EMG)	O	Option board select. Please select option board type in the KPG-49D.	OP	TX-RX (A/2)
OP1	O	Option code 1 (for voice scrambler code 1)	C1	TX-RX (A/2)
OP2	O	Option code 1 (for voice scrambler code 2)	C2	TX-RX (A/2)
OP3	O	Option code 1 (for voice scrambler code 3)	C3	TX-RX (A/2)
OP4	O	Option code 1 (for voice scrambler code 4)	C4	TX-RX (A/2)
SQ	O	Squelch signal output. Signal logic type can select "Carrier operate relay" or "Tone operate relay". Active logic level or type can select in the KPG-49D.	SQ	TX-RX (A/2)
TXD1	O	Serial data output 1	TD1	TX-RX (A/2)
RXD1	I	Serial data input 1	RD1	TX-RX (A/2)
TXD2	O	Serial data output 2	TD2	TX-RX (A/2)
RXD2	I	Serial data input 2	RD2	TX-RX (A/2)
RSSI	O	Receive signal strength indication	RSSI	TX-RX (A/2)
PTT	I	PTT	PTT	TX-RX (B/2)
MPTT	I	MIC PTT	MPTT	TX-RX (B/2)
FSW	I	Foot switch input	FW	TX-RX (A/2)
ST	I	Side-tone input	ST	TX-RX (A/2)

INSTALLATION







4. Ignition Sense Cable (KCT-18 : Option)

The KCT-18 is an optional cable for enabling the ignition function. The ignition function lets you turn the power to the transceiver on and off with the car ignition key.

If you use the Horn Alert function or the Manual Relay function, you can turn the function off while driving with the ignition key.

4-1. Connecting the KCT-18 to the Transceiver

1. Install the KCT-19 in the transceiver. (See the KCT-19 section.)
2. Insert the KCT-18 lead terminal (❷) into pin 3 of the square plug (❶) supplied with the KCT-19, then insert the square plug into the KCT-19 connector (❸).

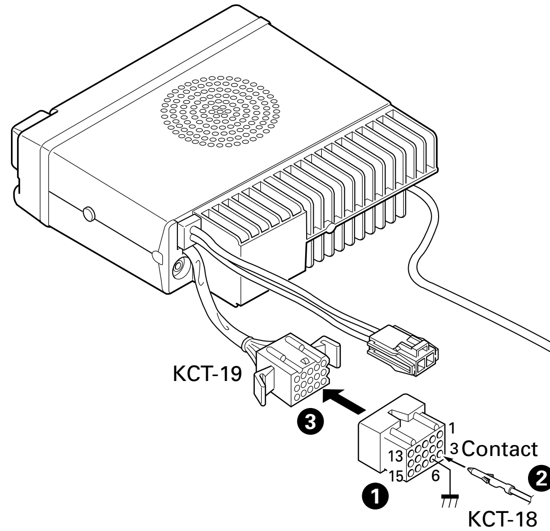


Fig. 3

4-2. Modifying the Transceiver

Modify the transceiver as follows to turn the power or the Horn Alert or Manual Relay function on and off with the ignition key.

1. Remove the lower half of the transceiver case.
2. Set jumper resistors (0Ω) R151 and R152 of the TX-RX unit (A/2) as shown in Table 1.

Operation when KCT-18 isconnected	R151	R152
KCT-18 cannot be connected	Enable	Enable
Power on/off and Horn Alert or AUX-A on/off	Disable	Enable
Horn Alert or AUX-A on/off, Timed power off	Enable	Disable
Power cannot be turned on	Disable	Disable

Table 1 R151 and R152 setup chart

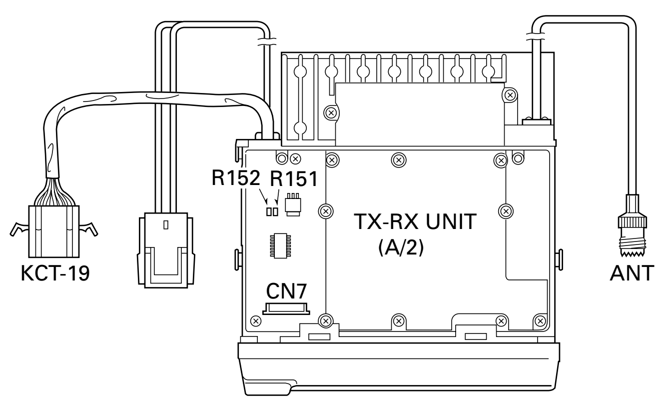


Fig. 4

INSTALLATION

5. Connection Cable (KCT-29 : Option)

The KCT-29 connection cable kit is used to connect the TK-780/780H transceiver to the KPG-1A Modem GPS Receiver or the KPG-1B Modem GPS Controller.

5-1. Installing the KCT-29 in the transceiver

1. Remove the upper cover from the transceiver.
2. Lift the DC cord bushing (❶) from the chassis.
3. Remove the pad as shown in Figure 5 (❷).
4. Insert the KCT-29 cable (❸) into the chassis (❹). The wire harness band (❺) must be inside the chassis.
5. Replace the DC cord bushing (❻).
6. Connect the KCT-29 to the TX-RX unit (A/2) as shown in Figure 6 (❼).

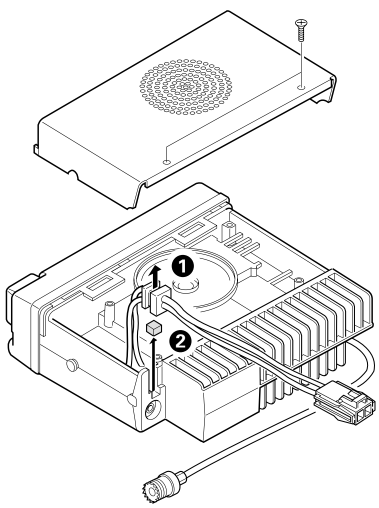


Fig. 5

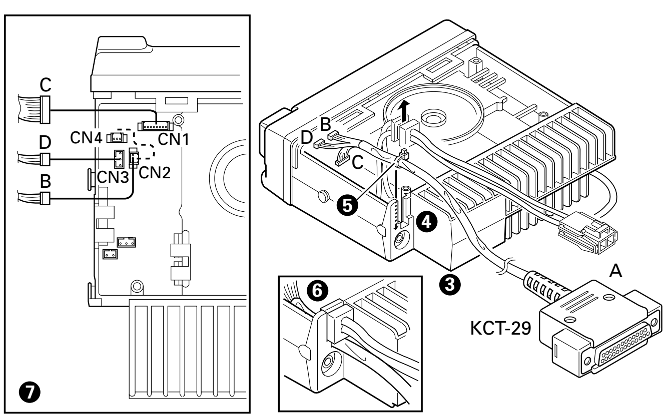


Fig. 6

6. Interface Cable (KCT-31 : Option)

The KCT-31 is a RS-232C interface cable for LMR mobile radios, TK-780/780H.

The 9-pin (D-sub) connector is connected to an external RS-232C terminal. The other end of the cable is connected to the internal connector of LMR mobile radio.

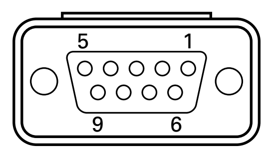
Note : You cannot write a firmware with the KCT-31.

6-1. Features

- This KCT-31 has a RS-232C-TTL level interface circuit.
- This KCT-31 does not require an external power supply.
- This KCT-31 can be used up to 9600 bps.
- Compatible with an ER terminal of DTE that has the voltage 6V or more.

6-2. Terminal function (D-sub connector)

Pin No.	I/O	Port name	Function
1	I	CD	Carrier detect
2	I	RD	Receive data
3	O	SD	Transmit data
4	O	ER	Data terminal ready
5	–	SG	Signal ground
6	I	DR	Data set ready
7	O	RS	Request to send
8	I	CS	Clear to send
9	–	CI	Ring indicator



INSTALLATION

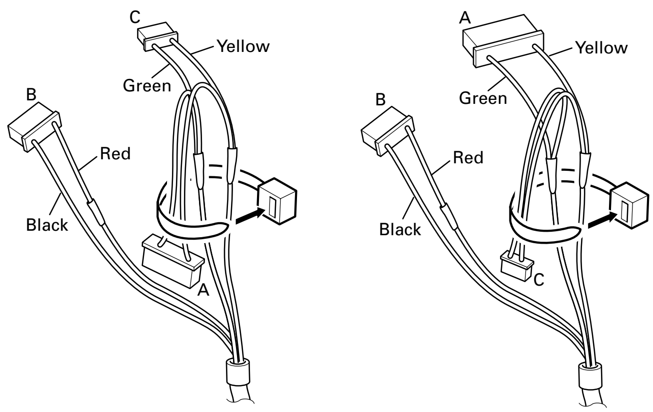
6-3. Installing the KCT-31 in the transceiver

Note :

When the COM1 is used, A connector is unused.
When the COM2 is used, C connector is unused.

1. Bind the unused connecor to the cable with a retaining band as shown.

When the COM1 is used. When the COM2 is used.



	A	B	C
COM1	No	Yes	Yes
COM2	Yes	Yes	No

Fig. 7

2. Make sure the unit's power is turned off.
3. Remove the upper case of the transceiver and lift the DC cable bushing (❶) from the chassis.
4. Remove the pad as shown in Figure 8 (❷).

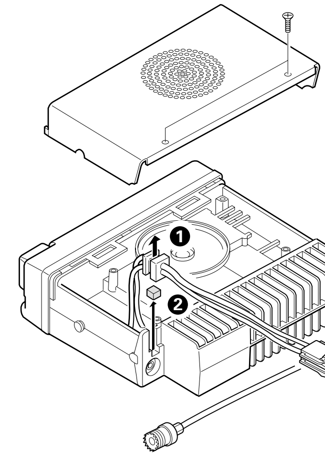


Fig. 8

5. Insert the KCT-31 cable (❸) into the chassis (❹).
   The write retaining band (❺) must be inside the chassis.
6. Replace the DC cable bushing (❻).
7. Connect the KCT-31 to the TX-RX unit (A/2) as shown in Figure 9 (❼).
8. Replace the upper case.

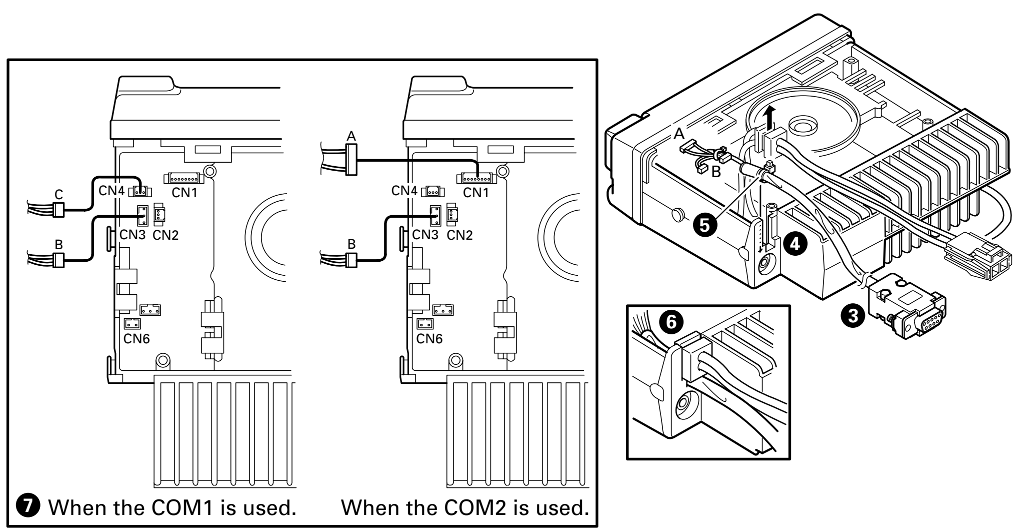


Fig. 9

Note :

- The modification must be applied to the TK-780/780H transceivers with a serial number of 30200000 or smaller when using a COM2 port. Replace the 47kΩ (R675) chip resistor on the TX-RX unit (B/2) with a 4.7kΩ resistor.

  Original New
  47kΩ (RK73GB1J473J) → 4.7kΩ (RK73GB1J472J)

- Enable the serial port function on the terminal.
- Refer to the service manual of each radio or the help file that came with the FPU (Field Programming Unit) for details.

INSTALLATION

7. PA/HA Unit (KAP-1 : Option)

7-1. Installing the KAP-1 in the Transceiver

The Horn Alert (max. 2A drive) and Public Address functions are enabled by inserting the KAP-1 W1 (3P; white/black/red) into CN3 on the TX-RX unit (A/2), inserting W2 (3P; green) into CN5 on the TX-RX unit (A/2), and connecting the KCT-19 (option) to CN2 and CN3 of the KAP-1.

- **Installation procedure**

1. Open the upper case of the transceiver.
2. Insert the two cables (❶) with connectors from the KAP-1 switch unit into the connectors on the transceiver.
3. Secure the switch unit board to the chassis with a screw (❸). The notch (❷) in the board must be placed at the front left side.
4. Attach the cushion on the top of the KAP-1 switch unit.

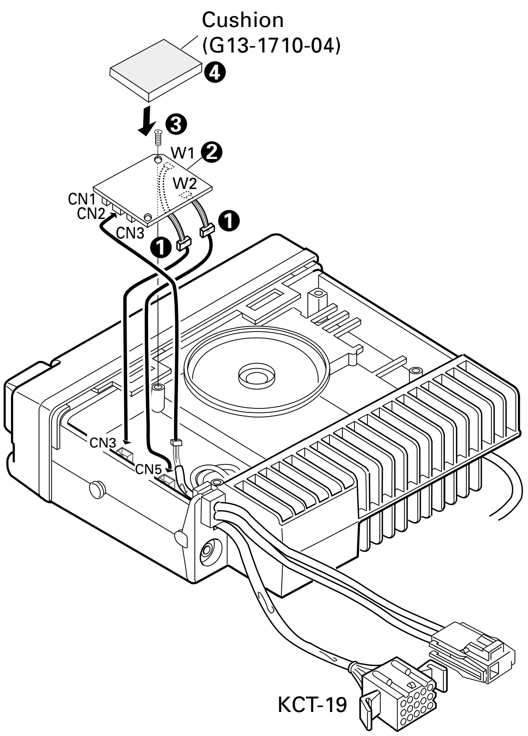


Fig. 10

8. Fitting the Control Panel Upside Down

The TK-780/780H control panel can be fitted upside down, so the transceiver can be mounted with its internal speaker (in the upper half of the case) facing down in your car.

1. Remove the control panel and the TX-RX unit (B/2) control section. (Fig. 11)

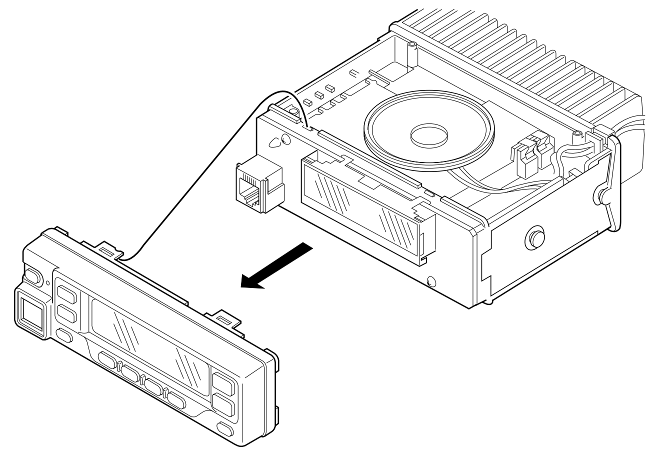


Fig. 11

2. Fold the flat cable (❶) in the opposite direction (❷).
3. Rotate the control section (❸) 180 degrees (❹).
4. Insert the flat cable into the control section connector, CN502 (❺).
5. Mount the control section on the transceiver (❻).

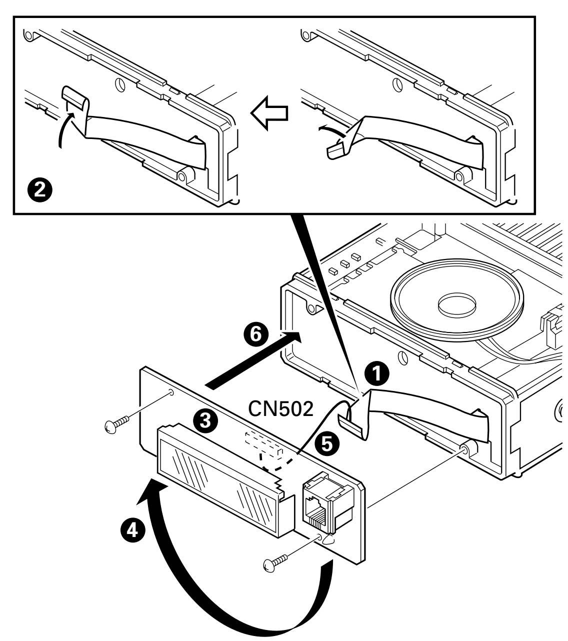


Fig. 12

INSTALLATION

6. Rotate the control panel 180 degrees and mount it on the transceiver. Refit the two halves of the case to complete installation. (Fig. 13)

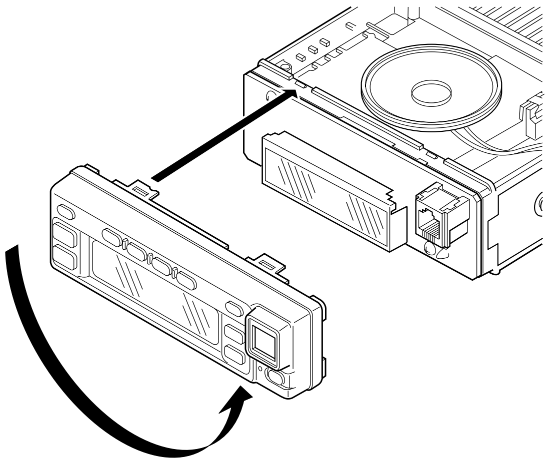


Fig. 13

9. External Speaker

9-1. KES-3 : Option

The KES-3 is an external speaker for the 3.5-mm-diameter speaker jack.

- **Connection procedure**

1. Connect the KES-3 to the 3.5-mm-diameter speaker jack on the rear of the transceiver.

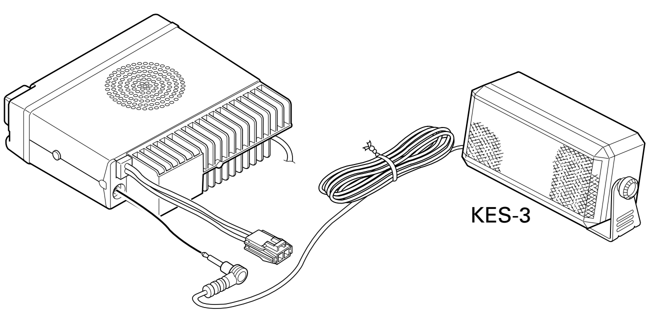


Fig. 14

9-2. KES-4 : Option

The KES-4 is an external speaker used with the accessory connection cable.

- **Connection procedure**

1. Install the KCT-19 in the transceiver. (See the KCT-19 section.)
2. Insert the crimp terminal into the square plug supplied with the KCT-19.
3. Connect CN5 of the transceiver to connector C of the KCT-19 instead of to the internal speaker connector.

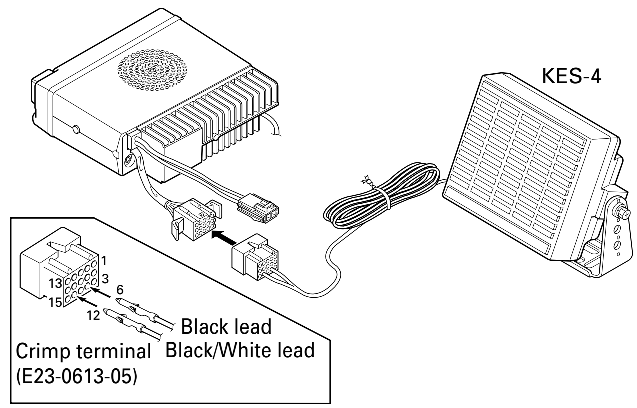


Fig. 15

Note : When installing KES-4, you must use an optional cable, KCT-19. Do not connect the KES-4 to 3.5mm speaker jack. The performance may be degrade.

CIRCUIT DESCRIPTION

Frequency Configuration

The TX-RX unit (A/2) incorporates a VCO, based on a fractional N type PLL synthesizer system, that allows a channel step of 2.5, 5, 6.25, 7.5kHz to be selected. The incoming signal from the antenna is mixed with a first local oscillation frequency to produce a first intermediate frequency of 44.85MHz.

The signal is then mixed with a second local oscillation frequency of 44.395MHz to produce a second intermediate frequency of 455kHz. This is called a double-conversion system. The TX-RX unit (A/2) contains a wide/narrow MCF and CFs. The transmit signal is produced by the PLL circuit for direction oscillation and division. The signal output from the VCO is amplified by a straight amplifier and transmitted.

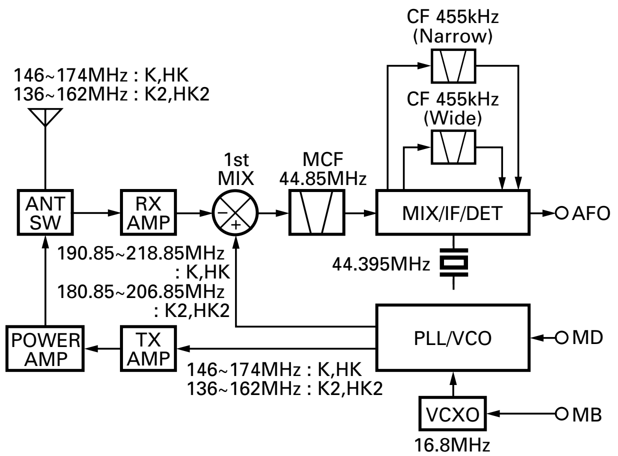


Fig. 1 Frequency configuration

Receiver System

■ Outline

The incoming signal from the antenna passes through a low-pass filter and a transmission/reception selection diode switch (D211, D212) and goes to the front end of the receiver. The front-end filter is a BPF, a variable BPF consisting of three coils and three varicap diodes (D206, D207, D208) to eliminate unwanted out-of-band signal components. The low-noise amplifier (LNA) (Q202) uses a bipolar transistor to achieve wide-band and low-distortion amplification.

The signal passes through the BPF and is down-converted with the first local signal by IC202 to produce the first IF signal of 44.85 MHz. The first local signal passes through an LPF and an attenuator to eliminate unwanted harmonics components and implement the optimum input level to the mixer, then enters IC202. A DBM is used as a mixer to achieve a high potential.

The signal output from the mixer passes through two MCFs (XF1). The signal is amplified by an intermediate frequency amplifier and input to the FM IF IC (IC11).

The first intermediate frequency signal is mixed with the second local signal of 44.395MHz to produce the second IF signal of 455kHz.

The unwanted near-by signal components are then eliminated by a wide ceramic filter (CF1) or a narrow ceramic filter (CF2) and the resulting signal goes back to the FM IF IC. The signal is quadrature-detected in the IC to produce an audio signal, which is amplified by a DET amplifier (IC2) and output to the TX-RX unit (B/2).

■ Wide/Narrow Changeover Circuit

The W/N port (pin 11) of the shift register (IC7) is used to switch between ceramic filters. When the W/N port is high, Q24 turns on and the ceramic filter SW diode (D22, D23) CF1 turns on to receive a Wide signal. At the same time, Q16 turns on and one of the filters is selected so that the wide and narrow audio output levels are equal.

When the W/N port is low, Q23 turns on and the ceramic filter SW diode (D22, D23) CF2 turns on to receive a Narrow signal.

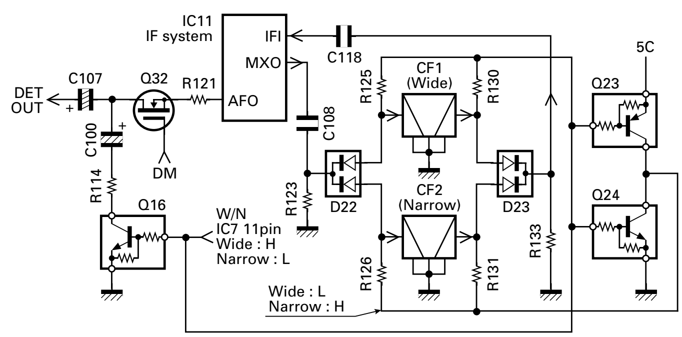


Fig. 3 Wide/Narrow changeover circuit

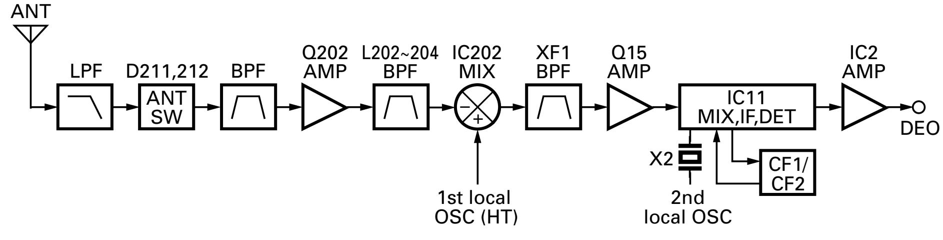


Fig. 2 Receiver system

CIRCUIT DESCRIPTION

■ AF Signal System

The detection signal (DEO) from the TX-RX unit (A/2) goes to the audio processor (IC504) of the TX-RX unit (B/2). The signal passes through a filter in the audio processor to adjust the gain, and is output to IC502. IC502 sums the AF signal and the DTMF signal and returns the resulting signal to the TX-RX unit (A/2). The signal (AFO) sent to the TX-RX unit (A/2) is input to the D/A converter (IC5). The AFO output level is adjusted by the D/A converter. The signal output from the D/A converter is added with the BEEP signal (BPO) and the resulting signal is input to the audio power amplifier (IC10). The AF signal from IC10 switches between the internal speaker and speaker jack (J1) output.

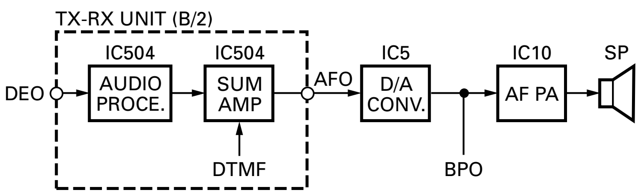


FIg. 4 AF signal system

■ Squelch Circuit

The detection output from the FM IF IC (IC11) is amplified by IC2 and the signal (DEO) is sent to the TX-RX unit (B/2). The signal passes through a high-pass filter and a noise amplifier (Q503) in the TX-RX unit (B/2) to detect noise. A voltage is applied to the CPU (IC511). The CPU controls squelch according to the voltage (ASQ) level. The signal from the RSSI pin of IC11 is monitored. The electric field strength of the receive signal can be known before the ASQ voltage is input to the CPU, and the scan stop speed is improved.

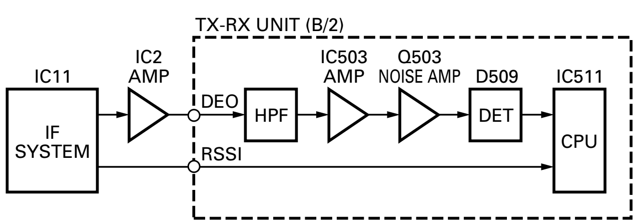


Fig. 5 Squelch circuit

Transmitter System

■ Outline

The transmitter circuit produces and amplifies the desired frequency directly. It FM-modulates the carrier signal by means of a varicap diode.

■ VCO/PLL Circuit

The TK-780/780H has a VCO for the transmitter and a VCO for the receiver in a sub-unit (A1). They are housed in a solid shielded case and connected to the TX-RX unit (A/2) through CN101. One of the VCOs is selected with an ST signal. A filtered low-noise power supply is used for the VCOs and varicap diodes.

The VCO for the transmitter is described below. It is designed so that Q103 turns on with a prescribed frequency when a reverse bias is applied to D102 and D107 by using the control voltage (CV) through CN101. The control voltage is changed by turning the trimmer capacitor (TC102). The output from Q103 is applied to the buffer amplifier (Q106) to generate a VCO output signal. This signal is used as a drive input signal or a local signal of the first mixer. Since a signal output from Q106 is input to the PLL IC, it passes through CN101 and buffer amplifier (Q300) and goes to the PLL IC (IC300). The modulation signal from CN101 is applied to D109 and passes through C125 and C126 to modulate the carrier.

The PLL IC uses a fractional N type synthesizer to improve the C/N ratio and lock-up speed. The VCO output signal input to the pin 5 of the PLL IC is divided to produce a comparison frequency according to a channel step. This signal is compared with the reference frequency which is output from the VCXO (X1). VCXO provides 16.8MHz, 2.5ppm (–30 to +60°C) and guarantees stable performance when the temperature changes. The TK-780/780H changes the VCXO reference voltage (MB) by software and fine-adjusts the reference oscillator frequency to use the set with a 2.5KHz frequency step. The output signal from the phase comparator passes through a charge pump in the PLL IC and an external active LPF (Q301, Q302) to generate a DC VCO control voltage CV. Serial data (DT, CK, EP) are output from the CPU (IC511) and shift register (IC8) in the TX-RX unit (B/2) to control the PLL IC. The PLL lock status is always monitored by the CPU.

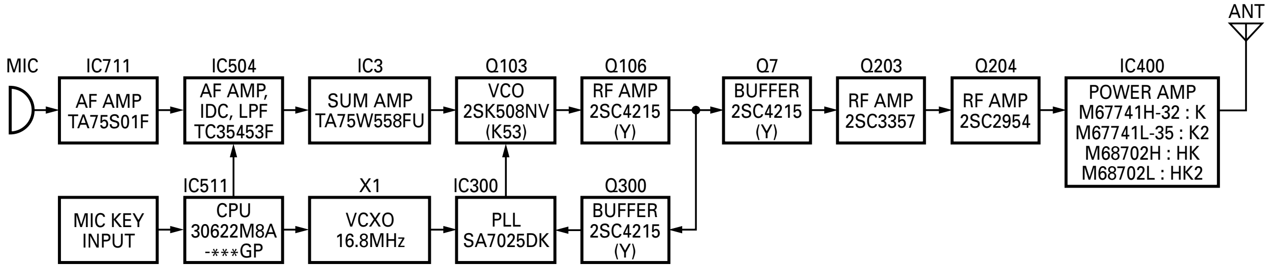


Fig. 6 Transmitter system

CIRCUIT DESCRIPTION

■ Unlock Circuit

During reception, the TR signal goes high, the KEY signal goes low, and Q10 turns on. Q11 turns on and a voltage is applied to the collector (8R). During transmission, the TR signal goes low, the KEY signal goes high and Q13 turns on. Q12 turns on and a voltage is applied to 8T.

The CPU in the TX-RX unit (B/2) monitors the PLL (IC300) LD signal directly. When the PLL is unlocked during transmission, the PLL LD signal goes low. The CPU detects this signal and makes the KEY signal low. When the KEY signal goes low, no voltage is applied to 8T, and no signal is transmitted.

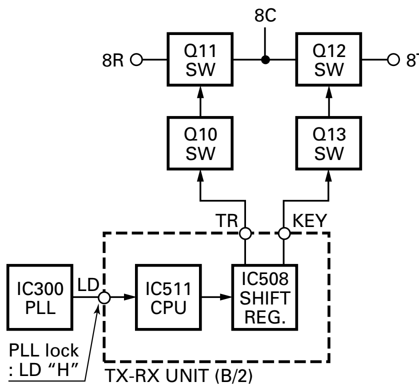


Fig. 7 Unlock circuit

■ Power Amplifier Circuit

The transmit output signal from the VCO is amplified to a specified level of the power module (IC400) by the drive block (Q203, Q204). The amplified signal passes through the transmission/reception selection diode (D211) and goes to a low-pass filter. The low-pass filter removes unwanted high-frequency harmonic components, and the resulting signal is goes the antenna terminal.

■ APC Circuit

The automatic transmission power control (APC) circuit detects part of a power module output with a diode (D27, D30) and applies a voltage to Q21. Q21 compares the APC control voltage (PC) generated by the D/A converter (IC5) and DC amplifier (IC6) with the detection output voltage to control Q19 and Q20, generates DB voltage from B voltage, and stabilizes transmission output.

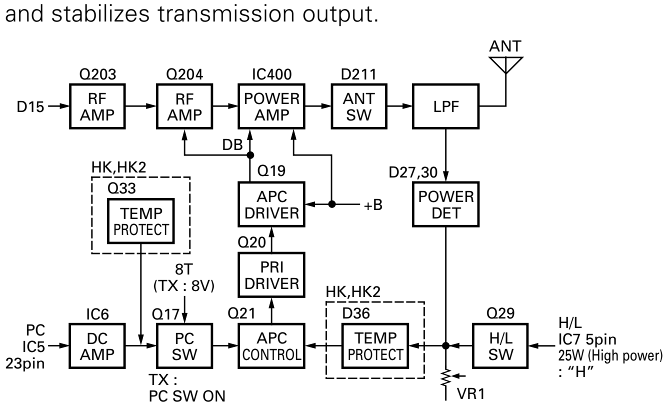


Fig. 8 APC circuit

Q17 turns the PC signal on or off using 8T so that the circuit works only during transmission. With stability at low power in mind, Q29 turns off to optimize the detection voltage.

The APC circuit is configured to protect overcurrent of the power module due to fluctuations of the load at the antenna end and to stabilize transmission output at voltage and temperature variations.

Control Circuit

The CPU carries out the following tasks:

1) Controls the shift register (IC7, IC8, IC508) AF MUTE, WIDE/NARROW, T/R KEY outputs.
2) Adjusts the AF signal level of the audio processor (IC504) and turns the filter select compounder on or off.
3) Controls the DTMF decoder (IC507).
4) Controls the LCD assembly display data.
5) Controls the PLL (IC300).
6) Controls the D/A converter (IC5) and adjusts the volume, modulation and transmission power.

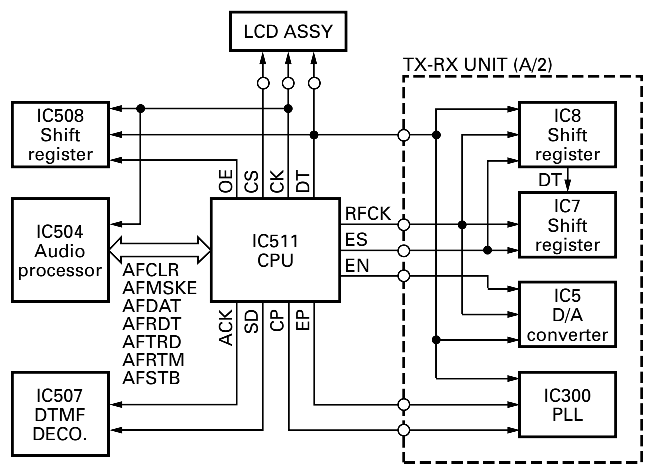


Fig. 9 Control circuit

■ Memory Circuit

The transceiver has a 2M-bit (256k x 8) flash ROM (IC510) and an 8k-bit EEPROM (IC512). The flash ROM contains firmware programs, data and user data which is programmed with the FPU. The EEPROM contains adjustment data. The CPU (IC511) controls the flash ROM through an external address bus and an external data bus. The CPU controls the EEPROM through two serial data lines.

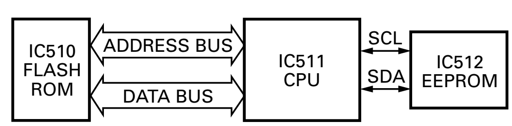


Fig. 10 Memory circuit

CIRCUIT DESCRIPTION

■ Display Circuit

The CPU (IC511) controls the shift register (IC508) and display LEDs. When the LG line goes high when the transceiver is busy, Q508 turns on and the green LED on D511 lights. In transmit mode, the LR line goes high, Q509 turns on and the red light lights. Backlighting LEDs for the key operation unit (D512~D517) and LCD are provided.

When the KBLC line goes high, Q512 turns on, then Q513 turns on, and the key illumination LED lights. A voltage is applied to the LEDA line to turn on the LCD backlight.

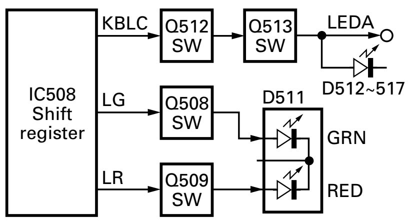


Fig. 11 Display circuit

■ Key Matrix Circuit

The TK-780/780H front panel has ten keys. Each of them is connected to a cross point of a matrix of the KEY1 to KEY7 ports of the microprocessor. The KEY5 to KEY7 ports are always high, while the KEY1 to KEY4 ports are always low.

The microprocessor monitors the status of the KEY1 to KEY7 ports. If the state of one of the ports changes, the microprocessor assumes that the key at the matrix point corresponding to that port has been pressed. Unused points (KEY1 to KEY7) are also used for foot switch (FSW) input.

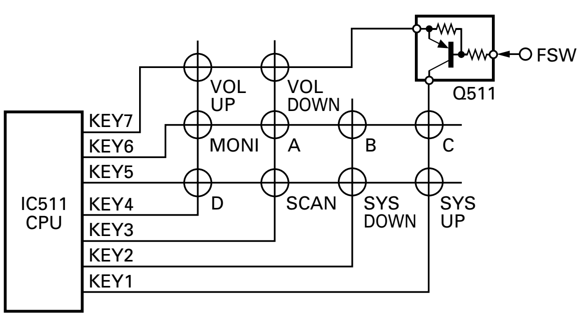


Fig. 12 Key matrix circuit

■ Encode

The QT, DQT, and LTR signals are output from LSDO of the CPU (IC511) and go to the D/A converter (IC5) of the TX-RX unit (A/2). The DTMF signal is output from HSDO of the CPU and goes to the audio processor (IC504). An MSK signal is output from the audio processor according to the data (AFDAT) from the CPU. The signal is summed with a MIC/MSK signal by the audio processor (IC504), and the resulting signal passes through an analog switch (IC506) and goes to the TX-RX unit (A/2) (MO).

MO is summed with the external pin DI line by the summing amplifier (IC3) and the resulting signal goes to the D/A converter (IC5). The D/A converter (IC5) adjusts the MO level and the balance between the MO and TO levels. Part of a TO signal is summed with an output signal from pin 3 (MO) of IC5 and the resulting signal goes to the MD pin of the VCO. This signal is applied to a varicap diode in the VCO for direct FM modulation.

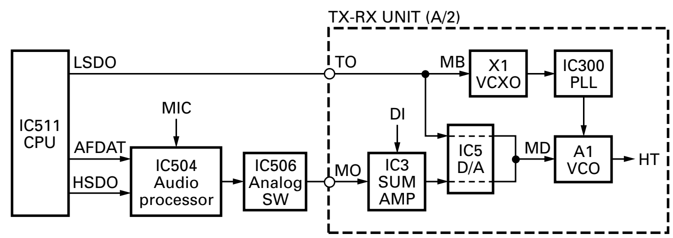


Fig. 13 Encode

■ Decode

The signal (DEO) detected by the TX-RX unit (A/2) passes through two low-pass filters of IC501, goes to LSDI of the CPU (IC511) to decode QT, DQT, and LTR. The DTMF signal is decoded by a dedicated IC (IC507) and the resulting signal is sent to the CPU (IC511) as serial data (STD).

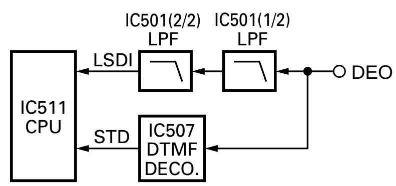


Fig. 14 Decode

■ D/A Converter

The D/A converter (IC5) is used to adjust TONE and MO modulation, beep, AF volume, TV voltage, FC reference voltage, and PC POWER CONTROL voltage level.

Adjustment values are sent from the CPU as serial data. The D/A converter has a resolution of 256 and the following relationship is valid:

D/A output = (Vin – VDAref) / 256 x n + VDAref

Vin: Analog input

VDAref: D/A reference voltage

n: Serial data value from the microprocessor (CPU)

CIRCUIT DESCRIPTION

■ Horn Control

The horn switch, consisting of Q4, Q5, and Q6, controls the horn relay. It is supplied by the dealer to provide the external horn alert function.

Q5 disables horn alert, turning on when its base is high, to inhibit the function. Normally, the output from IC7 is low, and Q6 is off; the base of Q4 is about 0V and Q4 is off. When horn alert is enabled, the output from IC7 goes high and Q6 turns on. The base current flows through R58 to Q4 to turn Q4 on. Q4 can sink a maximum of 100mA. If the operational KAP-1 is used, it can drive up to 2A.

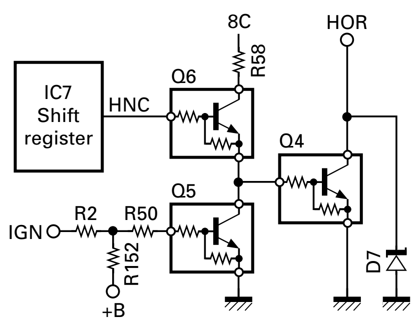


Fig. 15 Horn control

■ PA Switch

If the optional KAP-1 is used, the PA (Public Address) function becomes available. In this case, the signal flow changes as follows;

"PA2"	Q507	SW.A	SW.B	SW.D	Public address
L	L	L	H	H	OFF
H	H	H	L	L	ON

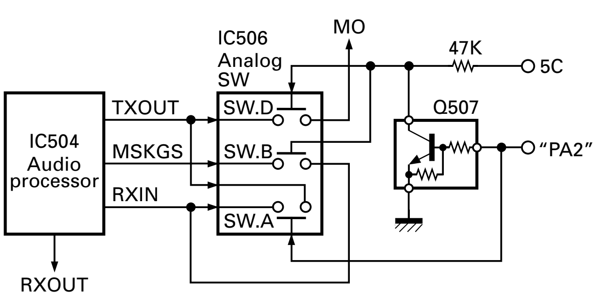


Fig. 16 PA switch

Power Supply Circuit

When the POWER switch on the TX-RX unit (B/2) is pressed, the PSW signal goes low. This signal is inverted by Q26 and sent to a flip-flop IC (IC15). This IC outputs a control signal when the PSW goes low. When the power turns on, pin 1 of IC15 outputs a low signal and Q30 turns on. The base of Q28 goes high, Q28 turns on, SB SW (Q27) turns on and power (SB) is supplied to the set.

This circuit has an over-voltage protection circuit. If a DC voltage of 20 V or higher is applied to the power cable, D34 turns on and a voltage is applied to the base of Q31. This voltage turns Q31 on and turns Q28 and SBSW off. This circuit has a TIMED POWER OFF (TOF) function which can be programmed by software.

It is controlled through pin 6 of IC7. When the TOF line goes high, Q22 turns on and then Q25 turns on. Pin 6 of IC15 goes high, then pin 1 goes high to turn Q27 off.

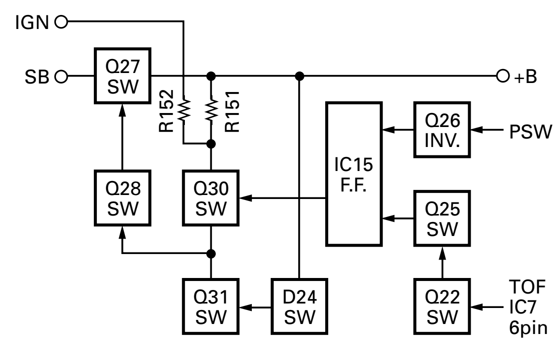


Fig. 17 Power supply circuit

SEMICONDUCTOR DATA

Microprocessor : 30622M8A-4F9GP (TX-RX Unit (B/2) IC511)

■ Terminal function

Pin No.	Name	I/O	Function
1	LSDOUT	O	Low speed data output.
2	HSDOUT	O	High speed data output.
3	HSDIN	I	High speed data input.
4	DTMSTD	I	DTMF decode IC data detect input.
5	SELF	I	Self programming mode input.
6	BYTE	I	+5V.
7	CNVSS	I	GND.
8	SFTOE	O	Shift register output enable.
9	LCDCS	O	LCD driver chip select output.
10	RESET	I	Microcomputer reset input.
11	XOUT	–	9.8304MHz (System clock).
12	VSS	–	GND.
13	XIN	–	9.8304MHz (System clock).
14	VCC	–	+5V.
15	IGN	I	Ignition input.
16	AFTRD	I	MSK modulation data output timing pulse input.
17	AFRTM	I	MSK demodulation data input timing pulse input.
18	MICDAT	O	MIC key data output.
19	CP	O	PLL IC clock output.
20	BEEP	O	Beep data output.
21	AFRDT	I	MSK demodulation data input.
22	AFREG1	O	AF IC register switching data output 1.
23	AFREG2	O	AF IC register switching data output 2.
24	EEPDAT	O	EEPROM data output.
25	EN	O	D/A converter IC data strobe output.
26	AFCLR	O	MSK flame reset output.
27	RXCOM2	I	External hook input / External serial interface input.
28	TXCOM2	I/O	External PTT input / External serial interface output.
29	TXCOM1	O	External serial interface output.
30	RXCOM1	I	External serial interface input.
31	LD	I	PLL unlock detect input.
32	AFMSKE	O	MSK modulation enable. (Enable active "H")
33	TXD	O	Serial interface output.
34	HOOK	I	Hook input / Serial interface input.
35	AFDAT	O	MSK data output.

Pin No.	Name	I/O	Function
36	RFCLK	O	Common clock output. (TX-RX unit A/2)
37	RDY	–	Not used.
38	ALE	–	Not used.
39	HOLD	–	Not used.
40	HLDA	–	Not used.
41	BLCK	–	Not used.
42	RD	–	Flash memory RD bus.
43	BHE	–	Not used.
44	WR	–	Flash memory WR bus.
45	DTMCLK	O	DTMF decode IC clock output.
46	CNTCLK	O	Common clock output. (TX-RX unit B/2)
47	EP	O	PLL IC data strobe output.
48	CSO	O	Flash memory chip enable.
49	A19	–	Not used.
50~59	A18~A9	–	Flash memory address bus.
60	VCC	–	+5V.
61	A8	–	Flash memory address bus.
62	VSS	–	GND.
63~70	A7~A0	–	Flash memory address bus.
71~74	KEY1~KEY4	I/O	Key matrix data input/output 1~4.
75	MINDAT	O	Common data output.
76~78	KEY5~KEY7	I	Key matrix data input 5~7.
79~86	D7~D0	–	Flash memory data bus.
87	DTMDAT	I	DTMF decode IC data input.
88	AUXDTC	I	External DTC input.
89	MICBLC	O	MIC back light control output.
90	POWSW	I	Power switch input.
91	ANLSQL	I	Squelch level input.
92	PTT	I	PTT switch input.
93	RSSI	I	Received signal strength indicator input.
94	AVSS	–	GND.
95	LSDIN	I	Low speed data input.
96	VREF	–	+5V.
97	AVCC	–	+5V.
98	ES1	O	Shift register data strobe output. (TX-RX unit B/2)
99	ES2	O	Shift register data strobe output. (TX-RX unit A/2)
100	AFSTB	O	AF IC data strobe output.

SEMICONDUCTOR DATA

Shift Register : BU4094BCFV

■ Terminal function (TX-RX unit (B/2) IC508)

Pin No.	Port	Name	Function
1	ES	ES1	Strobe
2	DT	DAT	Data
3	CK		Clock
4	Q1	LEDR	Red LED. H : ON, L : OFF
5	Q2	LEDG	Green LED. H : ON, L : OFF
6	Q3	KEYBLT	Key back light. H : ON, L : OFF
7	Q4	MMUTE	MIC mute. H: Mute, L : Unmute
8	VSS		GND
9			NC
10			NC
11	Q8	PA2	Public address 2. H : ON, L : OFF
12	Q7	BSHIFT	Beat shift. H : ON, L : OFF
13	Q6	KEY	TX power switching. H : TX, L : RX
14	Q5	T/R	TX/RX switching. H : RX, L : TX
15	OE		Output enable
16	VDC		+5V

■ Terminal function (TX-RX unit (A/2) IC8)

Pin No.	Port	Name	Function
1	STB	ES	Strobe
2	SI	DT	DATA
3	CLK	CK	Clock
4	Q1	AM1	Audio mute 1. H : Mute, L : Unmute
5	Q2	LOK	Link complete. (Programmable active H/L)
6	Q3	STR	VCO shift switching. H : TX, L : RX
7	Q4	DM	Dead mute. H : RX, L : TX
8	VSS		GND
9	QS		IC7 data output
10			NC
11	Q8	SQ	External squelch. (Programmable active H/L)
12	Q7	CODE2	Option board data 2. H : ON, L : OFF
13	Q6	CODE1	Option board data 1. H : ON, L : OFF
14	Q5	OPT	Option board control. H : ON, L : OFF / Auxiliary B. (Programmable active H/L)
15	OE		Output
16	VDC		+5V.

■ Terminal function (TX-RX unit (A/2) IC7)

Pin No.	Port	Name	Function
1	STB	ES	Strobe
2	SI	DT	Data
3	CLK	CK	Clock
4	Q1	HORN	Horn alert. H : ON, L : OFF / Auxiliary A. H : ON, L : OFF
5	Q2	HL	RF power switching. H : High, L : Low
6	Q3	TIMOFF	Timed power off. H : Power off
7	Q4	CODE3	Option board data 1. H : ON, L : OFF
8	VSS		GND
9			NC
10			NC
11	Q8	W/N	Wide/Narrow switching. H : Wide, L : Narrow
12	Q7	BUSY	Trunked system busy. H : Not busy, L : Busy
13	Q6	PA1	Public address 1. H : ON, L : OFF
14	Q5	CODE4	Option board data 1. H : ON, L : OFF
15	OE		Output enable
16	VDC		+5V

DESCRIPTION OF COMPONENTS

TX-RX Unit (X57-6480-XX) (A/2)

-10 : K -11 : K2 -12 : HK -13 : HK2

Ref. No.	Use / Function	Operation / Condition
IC1	DC amp	FC, TCXO control
IC2	DET amp	External DEO, internal DEO
IC3	Amp/Summing amp	DI / DI and MO addtion
IC4	Analog switch	DI switch
IC5	A/D converter	PC, TV, FC, AFO, BEEP, TO, MO control
IC6	DC amp	PC
IC7	Shift register	HNC, H/L, TOF, CODE3, CODE4, PA, BUSY, W/N control
IC8	Shift register	AM, LOK, STR, DM, OPT, CODE1, CODE2, SQ control
IC9	5V AVR	External 5C
IC10	AF power amp	
IC11	FM IF DET	Quadrature detector, 2nd mixer, OSC, IF amplifier, RSSI
IC12	5V AVR	5C
IC13	9V AVR	9C
IC14	8V AVR	8C
IC15	Flip-flop	Power control
IC201	DC amp	TV
IC202	Mixer	DBM
IC300	PLL	Reference 16.8MHz. PLL lock : LD “H”
IC400	Power module	RF power 25W
IC401	TX power amp	
Q1	DC switch	R17 connection and, PTT “H” time DI off
Q2	Ripple filter	8CL
Q3	Ripple filter	9CL
Q4	HOR switch	IGN
Q5	HOR SW control	IGN
Q6	HOR SW control	HNC “H” time on
Q7	Buffer amp	HT
Q8	AF mute	AM “H” time on
Q9	AF mute	Power off time on
Q10	8R SW control	TR “H” time on
Q11	8R switch	Q10 on time on
Q12	8T switch	Q13 on time on
Q13	8T SW control	KEY “H” time on
Q15	IF amp	44.85MHz
Q16	DET output level switch	Wide time on
Q17	PC switch	TX (8T) time on

Ref. No.	Use / Function	Operation / Condition
Q18	DET mute	KEY “H” time on
Q19	APC	APC driver
Q20	APC	APC pre-driver
Q21	APC control	
Q22	TOF switch	TOF “H” time on
Q23	W/N switch	Wide time off
Q24	W/N switch	Wide time on
Q25	TOF switch	Q22 on time on
Q26	Inverter	Power switch “L” time on
Q27	SB switch	Q28 on time on
Q28	SB SW control	Q30 on and Q31 off time on
Q29	H/L switch	High power time “H”
Q30	SB SW control	Power on time on
Q31	SB SW control	DC 20V and over time on
Q32	DET mute	TX time on
Q33	Temperature protection	
Q202	LNA	
Q203	RF amp	TX drive first
Q204	RF amp	TX drive last
Q300	Buffer amp	PLL
Q301,302	Active filter	
Q401	Short protection	IC400 out short time on
Q402	W/N switch	Wide time off
Q403	W/N switch	Wide time on
D1~6	Protection	
D7	HOR protection	
D8,9	Protection	
D11	OR gate	AF mute
D12~14	Protection	
D15	HT switch	
D16	Reverse protection	
D17	Protection	
D20	Reverse protection	IGN
D21	Protection	5V (IGN)
D22,23	W/N CF change	
D24	Over current protection	
D26	Reverse protection	
D27	Power detection	
D28	Protection	
D30	Power detection	
D31	Reverse protection	
D32	Surge absorption	B
D34	Protection	DC 20V and over time on
D35	Charge	DEO

DESCRIPTION OF COMPONENTS

Ref. No.	Use / Function	Operation / Condition
D36	Temperature protection	
D37	Reverse protection	
D206~208	Front tune	
D209,210	Usable temperature range	
D211	ANT swtich	TX time on
D212	ANT switch	
D213	Over voltage protection	

TX-RX Unit (X57-6480-XX) (B/2)
-10 : K -11 : K2 -12 : HK -13 : HK2

Ref. No.	Use / Function	Operation / Condition
IC501	LPF, amplification	LSD
IC502	Amplification	AF, HSD
IC503	Base voltage/ Buffer amp	ASQ
IC504	Audio processor	Compander, MIC amplifier, ALC, Modem, AF filter, IDC
IC506	Analog switch	MO, DEO, EMG, MI switch
IC507	DTMF decoder	DTMF detection
IC508	Shift register	LR, LG, KBLC, MM1, T/R, KEY, BSFT, PA2 output
IC509	Reset	Power on time “L” output
IC510	Flash ROM	
IC511	CPU	
IC512	EEPROM	
IC513	5V AVR	5C (TX-RX unit B/2)
IC710	Buffer amp	HSD
IC711	Buffer amp	MIC
Q501	MIC mute	MM “H” and MM1 “H” time mute on
Q502	AF mute	KEY “H” time mute on
Q503	Noise amp	
Q507	Inverter	PA2 H/L switch
Q508	LED switch	LG “H” time on, Busy time green on
Q509	LED switch	LR “H” time on, TX time red on
Q510	Clock switch shift	BSFT “H” time clock shift on
Q511	FSW swtich	FSW “L” time foot switch on
Q512	Key backlight switch	KBLC “H” time on
Q513	Key backlight switch	KBLC “H” time key backlight on
Q515	Key backlight switch	

Ref. No.	Use / Function	Operation / Condition
D501	Surge absorption	BLC
D502	Over current protection	PSB
D503	Surge absorption	CM
D504	Surge absorption	PTT/TXD
D505	Surge absorption	HOOK/RXD
D507	OR gate (MIC mute)	MM/MM1
D508	Limiter	MIC
D509	Limiter	ASQ
D510	Reverse current protection	C575 charge
D511	BUSY/TX LED (Green/Red)	Busy time green on, TX time red on
D512~517	Key backlight	KBLC “H” time on
D518	Current regulation	Key backlight
D520	Discharge	Speed up

VCO Unit (X58-4540-11) : K2,HK2
(X58-4712-70) : K,HK

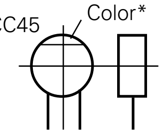
Ref. No.	Use / Function	Operation / Condition
Q101	Inverter	TX (ST “H”) time on
Q102	Oscillator	RX
Q103	Oscillator	TX
Q104	TX/RX switch	TX (ST “H”) time on
Q105	TX/RX switch	Q101 off time on
Q106	Buffer amp	
D101	RX VCO	
D102	TX VCO	
D103,104	RX VCO	
D106,107	TX VCO	
D109	Modulation	

PARTS LIST

CAPACITORS

CC 45 TH 1H 220 J
1 2 3 4 5 6

1 = Type … ceramic, electrolytic, etc.
2 = Shape … round, square, ect.
3 = Temp. coefficient
4 = Voltage rating
5 = Value
6 = Tolerance



• Capacitor value

010 = 1pF
100 = 10pF
101 = 100pF
102 = 1000pF = 0.001μF
103 = 0.01μF

2 2 0 = 22pF
Multiplier
2nd number
1st number

• Temperature coefficient

1st Word	C	L	P	R	S	T	U
Color*	Black	Red	Orange	Yellow	Green	Blue	Violet
ppm/°C	0	–80	–150	–220	–330	–470	–750

2nd Word	G	H	J	K	L
ppm/°C	±30	±60	±120	±250	±500

Example : CC45TH = –470 ± 60ppm/°C

• Tolerance (More than 10pF)

Code	C	D	G	J	K	M	X	Z	P	No code
(%)	±0.25	±0.5	±2	±5	±10	±20	+40	+80	+100	More than 10μF – 10 ~ +50
							–20	–20	–0	Less than 4.7μF –10 ~ +75

(Less than 10pF)

Code	B	C	D	F	G
(pF)	±0.1	±0.25	±0.5	±1	±2

• Voltage rating

1st word \ 2nd word	A	B	C	D	E	F	G	H	J	K	V
0	1.0	1.25	1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	–
1	10	12.5	16	20	25	31.5	40	50	63	80	35
2	100	125	160	200	250	315	400	500	630	800	–
3	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	–

• Chip capacitors

(EX) C C 7 3 F S L 1 H 0 0 0 J
1 2 3 4 5 6 7
(Chip) (CH, RH, UJ, SL)

(EX) C K 7 3 F F 1 H 0 0 0 Z
1 2 3 4 5 6 7
(Chip) (B, F)

Refer to the table above.

1 = Type
2 = Shape
3 = Dimension
4 = Temp. coefficient
5 = Voltage rating
6 = Value
7 = Tolerance

Dimension (Chip capacitors)

Dimension code	L	W	T
Empty	5.6 ± 0.5	5.0 ± 0.5	Less than 2.0
A	4.5 ± 0.5	3.2 ± 0.4	Less than 2.0
B	4.5 ± 0.5	2.0 ± 0.3	Less than 2.0
C	4.5 ± 0.5	1.25 ± 0.2	Less than 1.25
D	3.2 ± 0.4	2.5 ± 0.3	Less than 1.5
E	3.2 ± 0.2	1.6 ± 0.2	Less than 1.25
F	2.0 ± 0.3	1.25 ± 0.2	Less than 1.25
G	1.6 ± 0.2	0.8 ± 0.2	Less than 1.0
H	1.0 ± 0.05	0.5 ± 0.05	0.5 ± 0.05

RESISTORS

• Chip resistor (Carbon)

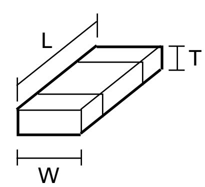
(EX) R D 7 3 E B 2 B 0 0 0 J
1 2 3 4 5 6 7
(Chip) (B,F)

• Carbon resistor (Normal type)

(EX) R D 1 4 B B 2 C 0 0 0 J
1 2 3 4 5 6 7

1 = Type … ceramic, electrolytic, etc.
2 = Shape … round, square, ect.
3 = Dimension
4 = Temp. coefficient
5 = Voltage rating
6 = Value
7 = Tolerance

Dimension



Dimension (Chip resistor)

Dimension code	L	W	T
E	3.2 ± 0.2	1.6 ± 0.2	1.0
F	2.0 ± 0.3	1.25 ± 0.2	1.0
G	1.6 ± 0.2	0.8 ± 0.2	0.5 ± 0.1
H	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05

Rating wattage

Code	Wattage	Code	Wattage	Code	Wattage
1J	1/16W	2C	1/6W	3A	1W
2A	1/10W	2E	1/4W	3D	2W
2B	1/8W	2H	1/2W		

TK-780/H

PARTS LIST

✽New Parts. ⚠ indicates safety critical components.
Parts without **Parts No.** are not supplied.
Les articles non mentionnes dans le **Parts No.** ne sont pas fournis.
Teile ohne **Parts No.** werden nicht geliefert.

L : Scandinavia **K**: USA **P** : Canada
Y: PX (Far East, Hawaii) **T**: England **E** : Europe
Y: AAFES (Europe) **X**: Australia **M**: Other Areas

TK-780/H
TX-RX UNIT (X57-6480-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti- nation
TK-780/780H					
1	1A		A01-2165-13	CABINET TOP	
2	2A		A01-2166-13	CABINET BOTTOM	
3	2A	✽	A62-0991-03	PANEL ASSY	
5	1D		B09-0235-05	CAP ACC	
6	2B		B38-0814-05	LCD ASSY	
7	2D	✽	B62-1549-00	INSTRUCTION MANUAL	
8	1C	✽	B72-1626-24	MODEL NAME PLATE	HK
8	1C	✽	B72-1674-24	MODEL NAME PLATE	HK2
8	1C	✽	B72-2016-04	MODEL NAME PLATE	K
8	1C	✽	B72-2017-04	MODEL NAME PLATE	K2
10	1C		E30-2145-15	ANTENNA CABLE	
11	1D	✽	E30-3339-05	DC CORD ACC	
12	1C	✽	E30-3340-05	DC CORD RADIO	
13	2B		E37-0789-05	FLAT CABLE CONT-TXRX	
14	1B	✽	E37-0790-25	LEAD WIRE WITH CONNECTOR (SP)	
16	2B	✽	F20-1192-04	INSULATING SHEET	
17	1D		F51-0016-05	FUSE (6✽30) 10A	K,K2
17	1D		F51-0017-05	FUSE (6✽30) 15A	HK,HK2
19	1C		G02-0791-04	FLAT SPRING AF,APC,AVR	
21	1B,1C	✽	G10-1221-04	FIBROUS SHEET SIDE	
22	1B	✽	G10-1222-14	FIBROUS SHEET UP DOWN	
23	1A,2A,2B	✽	G10-1223-14	FIBROUS SHEET SHIELD	
24	1C		G13-1468-04	CUSHION DC CORD	
25	1B		G13-1873-04	CUSHION SP	
26	2C		G53-0796-04	PACKING PHONE JACK	
28	3D	✽	H10-6618-12	POLYSTYRENE FOAMED FIXTURE (F)	K,K2
29	2E	✽	H10-6619-12	POLYSTYRENE FOAMED FIXTURE (B)	K,K2
29	3D		H10-6628-02	POLYSTYRENE FOAMED FIXTURE (B)	HK,HK2
28	2E		H10-6629-02	POLYSTYRENE FOAMED FIXTURE (F)	HK,HK2
30	1D		H12-1391-03	INNER PACKING CASE	
31	1D,2E		H25-0720-04	PROTECTION BAG (200X350)	
32	3E	✽	H52-1257-02	ITEM CARTON CASE	K,K2
32	3E	✽	H52-1481-02	ITEM CARTON CASE	HK,HK2
34	2D		J19-1584-05	HOLDER ACC	
35	1D		J29-0627-23	BRACKET ACC	
37	2B	✽	K29-5284-02	KEY TOP	
A	1A,2A		N33-2606-45	OVAL HEAD MACHINE SCREW	
B	2C		N67-3008-46	PAN HEAD SEMS SCREW W	
C	1B,1C,2B		N87-2606-46	BRAZIER HEAD TAPTITE SCREW	
D	2B		N87-2612-46	BRAZIER HEAD TAPTITE SCREW	
39	2D		N99-0395-05	SCREW SET	
41	1B		T07-0246-05	SPEAKER	
42	1D		T91-0621-05	MICROPHONE ACC	
TX-RX UNIT (X57-6480-XX) -10 : K -11 : K2 -12 : HK -13 : HK2					
D511			B30-2151-05	LED (RED/GREEN)	
D512-517			B30-2171-05	LED (D)	
C1-15			CK73GB1H102K	CHIP C 1000PF K	
C16			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
C17			CK73GB1C104K	CHIP C 0.10UF K	
C18			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
C19			CC73GCH1H100D	CHIP C 10PF D	
C20			CK73GB1E103K	CHIP C 0.010UF K	
C21,22			CK73GB1H102K	CHIP C 1000PF K	
C23			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
C24			CK73GB1H102K	CHIP C 1000PF K	
C25			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
C27			CK73GB1H102K	CHIP C 1000PF K	
C28			CC73GCH1H470J	CHIP C 47PF J	
C29			C92-0628-05	CHIP-TAN 10UF 10WV	
C30			CK73GB1H102K	CHIP C 1000PF K	
C31			C92-0628-05	CHIP-TAN 10UF 10WV	
C32			CC73GCH1H220J	CHIP C 22PF J	
C33			CK73GB1E103K	CHIP C 0.010UF K	
C34			C92-0694-05	CHIP C 10UF 16WV	
C35			CK73GB1E103K	CHIP C 0.010UF K	
C36			C92-0628-05	CHIP-TAN 10UF 10WV	
C37			C92-1341-05	ELECTRO 100UF 16WV	
C38			C92-0694-05	CHIP C 10UF 16WV	
C39			CK73GB1E103K	CHIP C 0.010UF K	
C40			CK73GB1H102K	CHIP C 1000PF K	
C41			C92-1341-05	ELECTRO 100UF 16WV	
C42			C92-0546-05	CHIP-TAN 68UF 6.3WV	
C43			CK73GB1E103K	CHIP C 0.010UF K	
C44			CK73GB1H102K	CHIP C 1000PF K	
C45			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
C46			C92-0004-05	CHIP-TAN 1.0UF 16WV	
C47			CK73GB1H102K	CHIP C 1000PF K	
C48			CK73FF1C105Z	CHIP C 1.0UF Z	
C49			CK73GB1H102K	CHIP C 1000PF K	
C51,52			CK73GB1H102K	CHIP C 1000PF K	
C54			CK73GB1C104K	CHIP C 0.10UF K	
C55			CC73GCH1H180J	CHIP C 18PF J	
C56			CK73GB1H102K	CHIP C 1000PF K	
C57			CK73GB1E103K	CHIP C 0.010UF K	
C58-60			CK73GB1H102K	CHIP C 1000PF K	
C61			CK73GB1E103K	CHIP C 0.010UF K	
C62			CC73GCH1H180J	CHIP C 18PF J	
C63			CK73FF1C105Z	CHIP C 1.0UF Z	
C64			CK73GB1E103K	CHIP C 0.010UF K	
C65			CK73GB1C104K	CHIP C 0.10UF K	
C66			CK73GB1H102K	CHIP C 1000PF K	
C68			CK73GB1C104K	CHIP C 0.10UF K	
C69			CC73GCH1H151J	CHIP C 150PF J	
C70			C92-0719-05	CHIP C 47UF 25WV	
C71			CK73GB1C104K	CHIP C 0.10UF K	
C72,73			CK73GB1H102K	CHIP C 1000PF K	
C74			C92-0719-05	CHIP C 47UF 25WV	
C75			C92-0044-05	CHIP-ELE 47UF 10WV	
C76			CK73GB1H102K	CHIP C 1000PF K	
C77			C92-0719-05	CHIP C 47UF 25WV	
C78			CK73GB1E103K	CHIP C 0.010UF K	
C79			C92-0722-05	CHIP C 10UF 6.3WV	
C80			CK73GB1C104K	CHIP C 0.10UF K	

PARTS LIST

TX-RX UNIT (X57-6480-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti- nation
C84			CC73GCH1H080D	CHIP C 8.0PF D	
C87			CK73GB1H471K	CHIP C 470PF K	
C88			CK73GB1E103K	CHIP C 0.010UF K	
C89			CK73GB1H471K	CHIP C 470PF K	
C90			CK73GB1H102K	CHIP C 1000PF K	
C91,92			CK73GB1E103K	CHIP C 0.010UF K	
C93			CK73GB1H102K	CHIP C 1000PF K	
C94			CK73GB1H471K	CHIP C 470PF K	
C95			CC73GCH1H150J	CHIP C 15PF J	
C96			CC73GCH1H180J	CHIP C 18PF J	
C97			CK73GB1H102K	CHIP C 1000PF K	
C98			CC73GCH1H150J	CHIP C 15PF J	
C99			CK73GB1H102K	CHIP C 1000PF K	
C100			C92-0628-05	CHIP-TAN 10UF 10WV	
C101			CK73GB1H102K	CHIP C 1000PF K	
C102			CC73GCH1H270J	CHIP C 27PF J	
C103			CK73GB1C104K	CHIP C 0.10UF K	
C104			CK73GB1E103K	CHIP C 0.010UF K	
C105,106			C92-0516-05	CHIP-TAN 4.7UF 16WV	
C107			C92-0628-05	CHIP-TAN 10UF 10WV	
C108			CK73GB1C104K	CHIP C 0.10UF K	
C109			CK73GB1H471K	CHIP C 470PF K	
C110			C92-0523-05	CHIP-ELE 10UF 16WV	K2
C111,112			CK73GB1H471K	CHIP C 470PF K	
C113			CK73GB1E103K	CHIP C 0.010UF K	
C114			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C115			CC73GCH1H270J	CHIP C 27PF J	
C116			C92-0712-05	CHIP-TAN 22UF 6.3WV	
C117			CK73GB1E103K	CHIP C 0.010UF K	
C118			CK73GB1C104K	CHIP C 0.10UF K	
C119			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C120			CK73GB1H102K	CHIP C 1000PF K	
C121			C92-0628-05	CHIP-TAN 10UF 10WV	
C123			CK73GB1C104K	CHIP C 0.10UF K	
C124			CK73GB1E103K	CHIP C 0.010UF K	
C125			CK73GB1H471K	CHIP C 470PF K	
C126			CK73GB1C104K	CHIP C 0.10UF K	
C127			CK73GB1E103K	CHIP C 0.010UF K	
C128			CK73GB1H471K	CHIP C 470PF K	
C129			CK73GB1E103K	CHIP C 0.010UF K	
C130			CK73GB1H102K	CHIP C 1000PF K	
C131			CK73GB1H471K	CHIP C 470PF K	
C132			CK73GB1C104K	CHIP C 0.10UF K	
C133			C92-0720-05	CHIP-ELE 100UF 25WV	
C134			CK73FB1E224K	CHIP C 0.22UF K	
C135			CK73GB1H102K	CHIP C 1000PF K	
C136			CK73FB1E224K	CHIP C 0.22UF K	
C137			CK73GB1H471K	CHIP C 470PF K	
C138			CC73FCH1H0R5B	CHIP C 0.5PF B	
C139			CC73FCH1H020B	CHIP C 2.0PF B	K2,HK2
C139			CC73FCH1H030B	CHIP C 3.0PF B	K,HK
C140			CK73GB1H471K	CHIP C 470PF K	K2,HK2
C140-143			CK73GB1H471K	CHIP C 470PF K	K,HK
C141			CK73GB1H103K	CHIP C 0.010UF K	K2,HK2
C142,143			CK73GB1H471K	CHIP C 470PF K	K2,HK2
C144			CK73GB1H102K	CHIP C 1000PF K	
C145			CK73GB1H103K	CHIP C 0.010UF K	K2,HK2
C145,146			CK73GB1H471K	CHIP C 470PF K	K,HK
C146			CK73GB1H471K	CHIP C 470PF K	K2
C147			CC73FCH1H0R5B	CHIP C 0.5PF B	

Ref. No.	Address	New parts	Parts No.	Description	Desti- nation
C148			CK73GB1H102K	CHIP C 1000PF K	
C149			CC73FCH1H010B	CHIP C 1.0PF B	K2,HK2
C149			CC73FCH1H020B	CHIP C 2.0PF B	K,HK
C150			CK73GB1H221K	CHIP C 220PF K	
C151			CC73GCH1H820J	CHIP C 82PF J	
C152			C92-0777-05	CHIP-ELE 1000UF 25WV	
C153			CC73GCH1H040C	CHIP C 4.0PF C	
C154,155			CK73GB1E103K	CHIP C 0.010UF K	
C156			CK73GB1C104K	CHIP C 0.10UF K	
C157			CK73GB1E103K	CHIP C 0.010UF K	
C161			CC73GCH1H101J	CHIP C 100PF J	
C163			CC73GCH1H221J	CHIP C 220PF J	
C167			CC73GCH1H100D	CHIP C 10PF D	
C168			C92-0585-05	CHIP-TAN 4.7UF 16WV	
C171,172			CK73GB1H103K	CHIP C 0.010UF K	HK,HK2
C173			C92-0606-05	CHIP-TAN 4.7UF 10WV	
C175			CK73GB1H102K	CHIP C 1000PF K	
C176,177			CC73GCH1H470J	CHIP C 47PF J	
C183			CC73GCH1H471J	CHIP C 470PF J	
C188			CK73GB1H102K	CHIP C 1000PF K	
C190			CK73GB1C104K	CHIP C 0.10UF K	
C196-198			CK73GB1H102K	CHIP C 1000PF K	
C200			C92-0523-05	CHIP-ELE 10UF 16WV	HK2
C201			CK73GB1H102K	CHIP C 1000PF K	
C202			C93-0552-05	CHIP C 2.0PF C	K
C204			CK73GB1E103K	CHIP C 0.010UF K	
C207,208			CK73GB1H102K	CHIP C 1000PF K	
C209			CK73GB1H103K	CHIP C 0.010UF K	K,HK
C209			CK73GB1H681K	CHIP C 680PF K	K2,HK2
C210			CK73GB1E103K	CHIP C 0.010UF K	
C211			CC73GCH1H160J	CHIP C 16PF J	
C212			CC73GCH1H020B	CHIP C 2.0PF B	
C213			CK73GB1H102K	CHIP C 1000PF K	
C214			CC73GCH1H150J	CHIP C 15PF J	
C215			CC73GCH1H020B	CHIP C 2.0PF B	
C216			CC73GCH1H160J	CHIP C 16PF J	
C217			CC73GCH1H180J	CHIP C 18PF J	
C222			CK73GB1H471K	CHIP C 470PF K	
C224			CK73GB1H471K	CHIP C 470PF K	
C225,226			CK73GB1C104K	CHIP C 0.10UF K	
C228			CK73GB1C104K	CHIP C 0.10UF K	
C229			CK73GB1H471K	CHIP C 470PF K	
C230			CK73GB1H102K	CHIP C 1000PF K	
C231			CC73GCH1H101J	CHIP C 100PF J	
C232			CK73GB1E103K	CHIP C 0.010UF K	
C233-236			CK73GB1H102K	CHIP C 1000PF K	
C237			CC73GCH1H270J	CHIP C 27PF J	
C238			CK73GB1H102K	CHIP C 1000PF K	
C239			CC73GCH1H180J	CHIP C 18PF J	
C240			CK73GB1H471K	CHIP C 470PF K	
C241			CC73GCH1H470J	CHIP C 47PF J	
C242			CC73FCH1H180J	CHIP C 18PF J	K
C242			CC73FCH1H220J	CHIP C 22PF J	K2
C242			CC73FCH1H220J	CHIP C 22PF J	HK,HK2
C243			CC73GCH1H470J	CHIP C 47PF J	
C244			CC73FCH1H040C	CHIP C 4.0PF C	K2,HK
C245			CK73GB1H102K	CHIP C 1000PF K	
C246			CK73GB1E103K	CHIP C 0.010UF K	
C247			C92-0719-05	CHIP-ELE 47UF 25WV	
C250			C92-0719-05	CHIP-ELE 47UF 25WV	K,K2

PARTS LIST

TX-RX UNIT (X57-6480-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
C251			C93-0558-05	CHIP C 8.0PF D	K
C251			C93-0561-05	CHIP C 12PF J	HK
C251			C93-0562-05	CHIP C 15PF J	HK2
C251,252			C93-0561-05	CHIP C 12PF J	K2
C252			C93-0553-05	CHIP C 3.0PF C	K
C252			C93-0556-05	CHIP C 6.0PF D	HK
C252			C93-0561-05	CHIP C 12PF J	HK2
C253			C93-0603-05	CHIP C 1000PF K	
C254			C93-0564-05	CHIP C 22PF J	HK
C254			C93-0565-05	CHIP C 27PF J	K2,HK2
C254			C93-0666-05	CHIP C 24PF J	K
C255			CC73FCH1H040C	CHIP C 4.0PF C	
C256			C93-0552-05	CHIP C 2.0PF C	K2
C256			C93-0556-05	CHIP C 6.0PF D	K
C256			C93-0558-05	CHIP C 8.0PF D	HK
C257			C93-0565-05	CHIP C 27PF J	K2,HK2
C257			C93-0666-05	CHIP C 24PF J	K,HK
C258			C93-0668-05	CHIP C 43PF	
C259			C93-0562-05	CHIP C 15PF J	K
C259			C93-0666-05	CHIP C 24PF J	K2
C259			C93-0666-05	CHIP C 24PF J	HK,HK2
C261			CC73GCH1H221J	CHIP C 220PF J	
C262-264			CC73GCH1H820J	CHIP C 82PF J	
C265			C93-0564-05	CHIP C 22PF J	K
C265			C93-0565-05	CHIP C 27PF J	K2,HK2
C265			C93-0666-05	CHIP C 24PF J	HK
C266			CC73GCH1H220J	CHIP C 22PF J	
C267			CC73GCH1H330J	CHIP C 33PF J	
C271			CC73GCH1H820J	CHIP C 82PF J	
C272			CC73GCH1H470J	CHIP C 47PF J	
C273			CC73GCH1H820J	CHIP C 82PF J	
C274			CC73GCH1H470J	CHIP C 47PF J	
C275			C92-0770-05	CHIP-ELE 47UF 35WV	HK,HK2
C276			CC73GCH1H090D	CHIP C 9.0PF D	HK
C277-282			CC73GCH1H470J	CHIP C 47PF J	
C283			CC73GCH1H060D	CHIP C 6.0PF D	K
C284			CC73GCH1H1R5C	CHIP C 1.5PF C	K
C285			CC73GCH1H060D	CHIP C 6.0PF D	K
C286			CC73GCH1H470J	CHIP C 47PF J	
C288			CC73GCH1H270J	CHIP C 27PF J	
C289			CC73GCH1H101J	CHIP C 100PF J	
C290			CC73GCH1H270J	CHIP C 27PF J	
C292-296			CC73GCH1H820J	CHIP C 82PF J	
C297			CC73GCH1H220J	CHIP C 22PF J	
C298			CC73GCH1H100D	CHIP C 10PF D	
C299			CC73GCH1H220J	CHIP C 22PF J	
C303			C92-0565-05	CHIP-TAN 6.8UF 10WV	
C304-306			CK73GB1H102K	CHIP C 1000PF K	
C307			CC73GCH1H130J	CHIP C 13PF J	
C309			CC73GCH1H270J	CHIP C 27PF J	
C311			CC73GCH1H130J	CHIP C 13PF J	
C312			CC73GCH1H180J	CHIP C 18PF J	
C313			CK73GB1H103K	CHIP C 0.010UF K	
C314			C92-0511-05	CHIP-TAN 0.15UF 35WV	
C315			CK73GB1C104K	CHIP C 0.10UF K	
C316			CK73GB1A224K	CHIP C 0.22UF K	
C317			CK73GB1H102K	CHIP C 1000PF K	
C318,319			CK73GB1C104K	CHIP C 0.10UF K	
C320			C92-0514-05	CHIP-TAN 2.2UF 10WV	
C321			CC73GCH1H060D	CHIP C 6.0PF D	
C322			C92-0514-05	CHIP-TAN 2.2UF 10WV	
C324			CK73FB1E104K	CHIP C 0.10UF K	
C325			C92-0002-05	CHIP-TAN 0.22UF 35WV	
C326			CK73FF1C105Z	CHIP C 1.0UF Z	
C327			CK73FB1E104K	CHIP C 0.10UF K	
C401			CK73GB1H102K	CHIP C 1000PF K	
C402			C92-0628-05	CHIP-TAN 10UF 10WV	
C406			CC73FCH1H102J	CHIP C 1000PF J	
C407			CC73FCH1H221J	CHIP C 220PF J	
C408			C92-0628-05	CHIP-TAN 10UF 10WV	
C501			CK73GB1H471K	CHIP C 470PF K	
C502			CC73GCH1H221J	CHIP C 220PF J	
C503,504			CK73GB1H471K	CHIP C 470PF K	
C505			CK73GB1C683K	CHIP C 0.068UF K	
C506			CK73GB1E123K	CHIP C 0.012UF K	
C508			CK73GB1C104K	CHIP C 0.10UF K	
C509			CK73GB1H222K	CHIP C 2200PF K	
C510			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
C511			CK73GB1H103K	CHIP C 0.010UF K	
C512			CK73GB1H471K	CHIP C 470PF K	
C513			CK73GB1H102K	CHIP C 1000PF K	
C514			CK73GB1H152K	CHIP C 1500PF K	
C515			CK73GB1C104K	CHIP C 0.10UF K	
C516,517			CK73GB1H103K	CHIP C 0.010UF K	
C518			CK73GB1H102K	CHIP C 1000PF K	
C519			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
C520			CC73GCH1H121J	CHIP C 120PF J	
C521,522			CK73GB1C104K	CHIP C 0.10UF K	
C523			CK73GB1H103K	CHIP C 0.010UF K	
C524			CK73GB1C104K	CHIP C 0.10UF K	
C525			CK73GB1H103K	CHIP C 0.010UF K	
C526			CK73GB1C104K	CHIP C 0.10UF K	
C527			CK73GB1C333K	CHIP C 0.033UF K	
C528			CK73GB1H102K	CHIP C 1000PF K	
C529			CK73GB1H562J	CHIP C 5600PF J	
C531			CK73GB1H562J	CHIP C 5600PF J	
C533			CK73GB1H562J	CHIP C 5600PF J	
C535			CK73GB1H102K	CHIP C 1000PF K	
C536			CC73GCH1H030C	CHIP C 3.0PF C	
C537			CK73GB1H272K	CHIP C 2700PF K	
C539			CK73GB1H272K	CHIP C 2700PF K	
C540			CC73GCH1H391J	CHIP C 390PF J	
C541			CC73GCH1H100D	CHIP C 10PF D	
C542			CC73GCH1H391J	CHIP C 390PF J	
C543			CK73GB1H272K	CHIP C 2700PF K	
C544			CC73GCH1H030C	CHIP C 3.0PF C	
C545			CK73GB1H102K	CHIP C 1000PF K	
C546			CK73GB1H122K	CHIP C 1200PF K	
C547			CK73GB1H102K	CHIP C 1000PF K	
C548			C92-0560-05	CHIP-TAN 10UF 6.3WV	
C549			CK73GB1C104K	CHIP C 0.10UF K	
C550			CC73GCH1H101J	CHIP C 100PF J	
C552			CK73GB1C333K	CHIP C 0.033UF K	
C553			CK73GB1H472K	CHIP C 4700PF K	
C554-558			CK73GB1C104K	CHIP C 0.10UF K	
C559			CK73GB1H102K	CHIP C 1000PF K	
C560			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
C561			CK73GB1H102K	CHIP C 1000PF K	
C562,563			CK73GB1H472K	CHIP C 4700PF K	
C564			CK73GB1E223K	CHIP C 0.022UF K	

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Ref. No.	Address	New parts	Parts No.	Description	Desti- nation
C565			CK73GB1H102K	CHIP C 1000PF K	
C566			CC73GCH1H101J	CHIP C 100PF J	
C567			CK73GB1C273K	CHIP C 0.027UF K	
C568			C92-0507-05	CHIP-TAN 4.7UF 6.3WV	
C569			CC73GCH1H470J	CHIP C 47PF J	
C570			CK73GB1C104K	CHIP C 0.10UF K	
C571			CK73GB1H102K	CHIP C 1000PF K	
C572			CK73FB1H563K	CHIP C 0.056UF K	
C574			CK73GB1C104K	CHIP C 0.10UF K	
C575			CK73FB1C334K	CHIP C 0.33UF K	
C576			CK73GB1C473K	CHIP C 0.047UF K	
C577			CK73GB1C104K	CHIP C 0.10UF K	
C578			CK73GB1H103K	CHIP C 0.010UF K	
C579			CK73GB1H472K	CHIP C 4700PF K	
C580			CK73GB1H102K	CHIP C 1000PF K	
C581,582			CK73GB1H103K	CHIP C 0.010UF K	
C583			CK73GB1H102K	CHIP C 1000PF K	
C584			CK73GB1H471K	CHIP C 470PF K	
C592			CK73GB1H102K	CHIP C 1000PF K	
C593			CK73GB1H103K	CHIP C 0.010UF K	
C594,595			CC73GCH1H270J	CHIP C 27PF J	
C596			CC73GCH1H680J	CHIP C 68PF J	
C597			CK73GB1H103K	CHIP C 0.010UF K	
C598,599			CC73GCH1H101J	CHIP C 100PF J	
C600,601			CK73GB1H102K	CHIP C 1000PF K	
C602			CK73GB1H103K	CHIP C 0.010UF K	
C603			CK73GB1C104K	CHIP C 0.10UF K	
C604			C92-0560-05	CHIP-TAN 10UF 6.3WV	
C605			CK73GB1H102K	CHIP C 1000PF K	
C606			CK73GB1H122K	CHIP C 1200PF K	
C607			CK73GB1H103K	CHIP C 0.010UF K	
C608			CK73GB1H392K	CHIP C 3900PF K	
C609,610			CK73GB1H103K	CHIP C 0.010UF K	
C613			C92-0606-05	CHIP-TAN 4.7UF 10WV	
C614			CK73GB1H102K	CHIP C 1000PF K	
C616			CK73GB1H102K	CHIP C 1000PF K	
C617			CC73GCH1H101J	CHIP C 100PF J	
C620			CC73GCH1H101J	CHIP C 100PF J	
C622,623			CK73GB1H102K	CHIP C 1000PF K	
C624			CC73GCH1H101J	CHIP C 100PF J	
C625			CK73GB1H102K	CHIP C 1000PF K	
C626			CC73GCH1H101J	CHIP C 100PF J	
C627			CK73GB1H102K	CHIP C 1000PF K	
C628			CC73GCH1H101J	CHIP C 100PF J	
C630			CK73GB1H102K	CHIP C 1000PF K	
C631-634			CC73GCH1H101J	CHIP C 100PF J	
C710			CK73GB1C104K	CHIP C 0.10UF K	
C711,712			CK73GB1H222K	CHIP C 2200PF K	
C713			CK73GB1H102K	CHIP C 1000PF K	
C714			CC73GCH1H331J	CHIP C 330PF J	
C715			CK73GB1H102K	CHIP C 1000PF K	
C718			C92-0606-05	CHIP-TAN 4.7UF 10WV	
C720			CC73GCH1H470J	CHIP C 47PF J	
C721-723			CC73GCH1H221J	CHIP C 220PF J	
C724			CK73GB1H822K	CHIP C 8200PF K	
C726			CK73GB1C104K	CHIP C 0.10UF K	
C728			CK73FB1H473K	CHIP C 0.047UF K	
TC1			C05-0371-05	CERAMIC TRIMMER CAP (10PF)	HK
CN1			E40-5737-05	PIN ASSY	

Ref. No.	Address	New parts	Parts No.	Description	Desti- nation
CN2			E40-5738-05	PIN ASSY	
CN3			E40-3247-05	PIN ASSY	
CN4			E40-5738-05	PIN ASSY	
CN5			E40-3247-05	PIN ASSY	
CN6			E40-3246-05	PIN ASSY	
CN7			E40-5982-05	FLAT CABLE CONNECTOR	
CN501			E40-5823-05	FLAT CABLE CONNECTOR	
CN502			E40-5982-05	FLAT CABLE CONNECTOR	
J1	2C		E11-0442-05	3.5D PHONE JACK (3P)	
J501	1B		E08-0877-05	MODULAR JACK	
-			J31-0543-05	COLLAR (LH-5-1.5)	
CF1			L72-0372-05	CERAMIC FILTER	
CF2			L72-0376-05	CERAMIC FILTER	
L1			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
L2			L92-0138-05	FERRITE CHIP	
L3			L40-4775-44	SMALL FIXED INDUCTOR (47.0NH)	
L4			L40-8272-37	SMALL FIXED INDUCTOR (0.082UH)	
L5			L40-1092-34	SMALL FIXED INDUCTOR	
L6			L34-4459-05	COIL	
L7			L40-8275-92	SMALL FIXED INDUCTOR (82NH)	
L11			L92-0140-05	FERRITE CHIP	HK,HK2
L12			L92-0138-05	FERRITE CHIP	
L14			L92-0191-05	FERRITE CHIP	
L202-204			L34-4555-05	COIL	K2,HK2
L202-204			L34-4641-05	COIL	K,HK
L205			L40-4775-36	SMALL FIXED INDUCTOR (47NH)	HK
L207-209			L39-1272-05	TOROIDAL COIL	
L211			L40-6871-34	SMALL FIXED INDUCTOR (68NH)	K,HK2
L211,212			L40-6871-34	SMALL FIXED INDUCTOR (68NH)	K2,HK
L212			L40-5671-34	SMALL FIXED INDUCTOR (56NH)	K,HK2
L213			L34-4478-05	AIR-CORE COIL	
L214			L34-4480-05	AIR-CORE COIL	
L215			L34-0499-05	AIR-CORE COIL	HK
L215			L34-0742-05	AIR-CORE COIL	K,K2
L215			L34-0742-05	AIR-CORE COIL	HK2
L216			L34-4482-05	AIR-CORE COIL	
L217,218			L34-0499-05	AIR-CORE COIL	HK
L217,218			L34-0742-05	AIR-CORE COIL	K,K2
L217,218			L34-0742-05	AIR-CORE COIL	HK2
L219			L40-3978-67	SMALL FIXED INDUCTOR (39NH)	K,HK
L219			L40-5678-67	SMALL FIXED INDUCTOR (56NH)	K2,HK2
L220			L40-2288-67	SMALL FIXED INDUCTOR (220NH)	
L221			L40-2778-67	SMALL FIXED INDUCTOR (27NH)	K,HK
L221			L40-3978-67	SMALL FIXED INDUCTOR (39NH)	K2,HK2
L222			L40-6878-67	SMALL FIXED INDUCTOR (68NH)	K,HK
L222,223			L40-8278-67	SMALL FIXED INDUCTOR (82NH)	K2,HK2
L223			L40-4778-67	SMALL FIXED INDUCTOR (47NH)	K,HK
L224			L40-4775-36	SMALL FIXED INDUCTOR (47NH)	HK
L225			L92-0193-05	FERRITE CHIP	
L226			L92-0155-05	FERRITE CHIP	
L227			L40-3378-67	SMALL FIXED INDUCTOR (33NH)	
L228			L40-1575-54	SMALL FIXED INDUCTOR (15NH)	K
L300,301			L40-3371-36	SMALL FIXED INDUCTOR (33NH)	
L302			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
L303			L40-4775-34	SMALL FIXED INDUCTOR (47NH)	
L501-508			L92-0138-05	FERRITE CHIP	
X1			L77-1777-05	TCXO (16.8M)	
X2			L77-1762-05	CRYSTAL RESONATOR (44.395MHZ)	
X501			L77-1708-05	CRYSTAL RESONATOR (3.579545MHZ)	

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Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
X502			L78-0462-05	RESONATOR (9.8304M)	
XF1			L71-0572-05	MCF (44.85MHZ)	
CP501			R90-0724-05	MULTI-COMP 1K X4	
R1			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R2			R92-1252-05	CHIP R 0 OHM	
R3,4			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R6,7			R92-1252-05	CHIP R 0 OHM	
R8			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R9			R92-1252-05	CHIP R 0 OHM	
R10,11			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R12			R92-1252-05	CHIP R 0 OHM	
R14			RK73GB1J473J	CHIP R 47K J 1/16W	
R15			RK73GB1J103J	CHIP R 10K J 1/16W	
R16			RK73GB1J104J	CHIP R 100K J 1/16W	
R17			R92-1252-05	CHIP R 0 OHM	
R19			RK73GB1J153J	CHIP R 15K J 1/16W	
R20			RK73GB1J104J	CHIP R 100K J 1/16W	
R21			RK73GB1J563J	CHIP R 56K J 1/16W	
R22			RK73GB1J104J	CHIP R 100K J 1/16W	
R23			RK73GB1J184J	CHIP R 180K J 1/16W	
R25			RK73GB1J394J	CHIP R 390K J 1/16W	
R26			RK73GB1J104J	CHIP R 100K J 1/16W	
R27			RK73GB1J473J	CHIP R 47K J 1/16W	
R28			R92-1252-05	CHIP R 0 OHM	
R29			RK73GB1J220J	CHIP R 22 J 1/16W	
R30,31			RK73GB1J104J	CHIP R 100K J 1/16W	
R32			RK73GB1J474J	CHIP R 470K J 1/16W	
R33			RK73GB1J153J	CHIP R 15K J 1/16W	
R34			R92-1252-05	CHIP R 0 OHM	
R35			RK73GB1J223J	CHIP R 22K J 1/16W	
R36			RK73GB1J103J	CHIP R 10K J 1/16W	
R37			R92-1252-05	CHIP R 0 OHM	
R39			RK73GB1J101J	CHIP R 100 J 1/16W	
R40			RK73GB1J103J	CHIP R 10K J 1/16W	
R41			RK73GB1J122J	CHIP R 1.2K J 1/16W	
R42			RK73GB1J104J	CHIP R 100K J 1/16W	
R44			RK73GB1J473J	CHIP R 47K J 1/16W	
R45			RK73GB1J104J	CHIP R 100K J 1/16W	
R46			RK73GB1J103J	CHIP R 10K J 1/16W	
R47			RK73GB1J473J	CHIP R 47K J 1/16W	
R48			RK73GB1J471J	CHIP R 470 J 1/16W	
R49			RK73GB1J391J	CHIP R 390 J 1/16W	
R50			RK73GB1J103J	CHIP R 10K J 1/16W	
R52			R92-1252-05	CHIP R 0 OHM	
R55			RK73GB1J153J	CHIP R 15K J 1/16W	
R56			RK73GB1J103J	CHIP R 10K J 1/16W	
R57			RK73GB1J473J	CHIP R 47K J 1/16W	
R58			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R59			R92-1252-05	CHIP R 0 OHM	
R60			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R61			RK73GB1J223J	CHIP R 22K J 1/16W	
R62			RK73GB1J101J	CHIP R 100 J 1/16W	
R63-65			R92-1252-05	CHIP R 0 OHM	
R66			RK73GB1J103J	CHIP R 10K J 1/16W	
R67			RK73GB1J101J	CHIP R 100 J 1/16W	
R68			RK73GB1J390J	CHIP R 39 J 1/16W	
R69			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R70-73			R92-1252-05	CHIP R 0 OHM	
R74			RK73GB1J473J	CHIP R 47K J 1/16W	

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
R75			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R76			RK73GB1J153J	CHIP R 15K J 1/16W	
R77			RK73GB1J333J	CHIP R 33K J 1/16W	
R78			RK73GB1J561J	CHIP R 560 J 1/16W	
R80			RK73GB1J473J	CHIP R 47K J 1/16W	
R85			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R86			R92-1252-05	CHIP R 0 OHM	
R89			R92-1252-05	CHIP R 0 OHM	
R90			RK73GB1J2R2J	CHIP R 2.2 J 1/16W	
R91			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R94			R92-1252-05	CHIP R 0 OHM	
R96			RK73GB1J181J	CHIP R 180 J 1/16W	K,HK
R96			RK73GB1J271J	CHIP R 270 J 1/16W	K2,HK2
R97,98			RK73GB1J473J	CHIP R 47K J 1/16W	
R99			RK73GB1J152J	CHIP R 1.5K J 1/16W	
R104			R92-1252-05	CHIP R 0 OHM	
R106			R92-1252-05	CHIP R 0 OHM	
R107			RK73GB1J473J	CHIP R 47K J 1/16W	
R109			R92-0670-05	CHIP R 0 OHM	
R110			RK73GB1J470J	CHIP R 47 J 1/16W	
R111			RK73GB1J331J	CHIP R 330 J 1/16W	
R112			RK73GB1J473J	CHIP R 47K J 1/16W	
R113			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R114			RK73GB1J392J	CHIP R 3.9K J 1/16W	
R116			RK73GB1J473J	CHIP R 47K J 1/16W	
R119			RK73GB1J103J	CHIP R 10K J 1/16W	
R120,121			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R122			RK73GB1J392J	CHIP R 3.9K J 1/16W	
R123			RK73GB1J153J	CHIP R 15K J 1/16W	
R124-126			RK73GB1J223J	CHIP R 22K J 1/16W	
R127			RK73FB2A103J	CHIP R 10K J 1/10W	K,K2
R127			RK73FB2A152J	CHIP R 1.5K J 1/10W	HK,HK2
R128			RK73GB1J223J	CHIP R 22K J 1/16W	
R129			RK73GB1J220J	CHIP R 22 J 1/16W	
R130,131			RK73GB1J223J	CHIP R 22K J 1/16W	
R132			RK73GB1J104J	CHIP R 100K J 1/16W	
R133			RK73GB1J153J	CHIP R 15K J 1/16W	
R134			RK73GB1J473J	CHIP R 47K J 1/16W	
R135			R92-1261-05	CHIP R 150 J 1/2W	
R137			RK73GB1J473J	CHIP R 47K J 1/16W	
R138			RK73FB2A100J	CHIP R 10 J 1/10W	
R139			R92-0670-05	CHIP R 0 OHM	K,K2
R140			R92-1252-05	CHIP R 0 OHM	
R141			RK73GB1J104J	CHIP R 100K J 1/16W	
R142			R92-0699-05	CHIP R 10 J 1/2W	
R143			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R144			RK73GB1J223J	CHIP R 22K J 1/16W	
R145			RK73GB1J104J	CHIP R 100K J 1/16W	
R146			R92-1215-05	CHIP R 470 J 1/2W	
R147			RK73FB2A333J	CHIP R 33K J 1/10W	HK
R147			RK73FB2A563J	CHIP R 56K J 1/10W	K,K2
R147			RK73FB2A563J	CHIP R 56K J 1/10W	HK2
R148			RK73FB2A472J	CHIP R 4.7K J 1/10W	
R149			RK73FB2A183J	CHIP R 18K J 1/10W	K,K2
R149			RK73FB2A183J	CHIP R 18K J 1/10W	HK
R149			RK73FB2A223J	CHIP R 22K J 1/10W	HK2
R150			R92-0670-05	CHIP R 0 OHM	
R151-153			R92-1252-05	CHIP R 0 OHM	
R154			RK73GB1J103J	CHIP R 10K J 1/16W	
R155			RK73GB1J333J	CHIP R 33K J 1/16W	

PARTS LIST

TX-RX UNIT (X57-6480-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
R156			RK73GB1J471J	CHIP R 470 J 1/16W	
R157			RK73GB1J101J	CHIP R 100 J 1/16W	
R158			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R161			RK73GB1J474J	CHIP R 470K J 1/16W	
R162,163			RK73FB2A103J	CHIP R 10K J 1/10W	
R164			RK73GB1J122J	CHIP R 1.2K J 1/16W	
R165,166			R92-1252-05	CHIP R 0 OHM	
R168			R92-1252-05	CHIP R 0 OHM	
R169			RK73GB1J474J	CHIP R 470K J 1/16W	
R170			R92-0670-05	CHIP R 0 OHM	
R171			RK73GB1J3R3J	CHIP R 3.3 J 1/16W	
R172			RK73GB1J561J	CHIP R 560 J 1/16W	
R173			RK73GB1J181J	CHIP R 180 J 1/16W	K,HK
R173			RK73GB1J271J	CHIP R 270 J 1/16W	K2,HK2
R175			RK73GB1J151J	CHIP R 150 J 1/16W	HK
R175			RK73GB1J181J	CHIP R 180 J 1/16W	HK2
R176			R92-0670-05	CHIP R 0 OHM	
R179			R92-1252-05	CHIP R 0 OHM	K
R179,180			R92-1252-05	CHIP R 0 OHM	K2
R179,180			R92-1252-05	CHIP R 0 OHM	HK,HK2
R201			R92-1252-05	CHIP R 0 OHM	
R209			R92-1252-05	CHIP R 0 OHM	
R211			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R212			RK73GB1J272J	CHIP R 2.7K J 1/16W	
R213			RK73GB1J150J	CHIP R 15 J 1/16W	K,HK
R213			RK73GB1J220J	CHIP R 22 J 1/16W	K2,HK2
R214			RK73GB1J272J	CHIP R 2.7K J 1/16W	
R215			RK73GB1J104J	CHIP R 100K J 1/16W	
R217			RK73GB1J470J	CHIP R 47 J 1/16W	
R218-220			RK73GB1J104J	CHIP R 100K J 1/16W	
R221			RK73GB1J274J	CHIP R 270K J 1/16W	
R222			R92-1252-05	CHIP R 0 OHM	
R223			RK73GB1J104J	CHIP R 100K J 1/16W	
R224			R92-1252-05	CHIP R 0 OHM	
R225			RK73GB1J820J	CHIP R 82 J 1/16W	
R226			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R228			RK73GB1J271J	CHIP R 270 J 1/16W	
R229			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R230			RK73GB1J180J	CHIP R 18 J 1/16W	
R231			RK73GB1J271J	CHIP R 270 J 1/16W	
R232			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R233			RK73GB1J103J	CHIP R 10K J 1/16W	
R234			RK73GB1J100J	CHIP R 10 J 1/16W	
R235			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R236			RK73GB1J560J	CHIP R 56 J 1/16W	
R237			RK73GB1J470J	CHIP R 47 J 1/16W	
R238			RK73GB1J152J	CHIP R 1.5K J 1/16W	
R239			RK73FB2A100J	CHIP R 10 J 1/10W	
R240			R92-0685-05	CHIP R 22 J 1/2W	
R241			RK73FB2A102J	CHIP R 1.0K J 1/10W	K
R246			RK73GB1J182J	CHIP R 1.8K J 1/16W	
R247			RK73GB1J2R7J	CHIP R 2.7 J 1/16W	
R248			RK73GB1J182J	CHIP R 1.8K J 1/16W	
R249			RK73FB2A102J	CHIP R 1.0K J 1/10W	K2
R249			RK73FB2A471J	CHIP R 470 J 1/10W	HK,HK2
R250			RK73FB2A100J	CHIP R 10 J 1/10W	K2
R250			RK73FB2A120J	CHIP R 12 J 1/10W	HK,HK2
R250			R92-0670-05	CHIP R 0 OHM	K
R251			RK73FB2A102J	CHIP R 1.0K J 1/10W	K2
R251			RK73FB2A471J	CHIP R 470 J 1/10W	HK,HK2
R252			RK73FB2A100J	CHIP R 10 J 1/10W	K2
R300-303			RK73GB1J470J	CHIP R 47 J 1/16W	
R304			R92-1252-05	CHIP R 0 OHM	
R305			RK73GB1J103J	CHIP R 10K J 1/16W	
R306			RK73GB1J271J	CHIP R 270 J 1/16W	
R307			R92-1252-05	CHIP R 0 OHM	
R308			RK73GB1J101J	CHIP R 100 J 1/16W	
R309			RK73GB1J333J	CHIP R 33K J 1/16W	
R310			RK73GB1J103J	CHIP R 10K J 1/16W	
R311			RK73GB1J271J	CHIP R 270 J 1/16W	
R312			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R313			RK73GB1J822J	CHIP R 8.2K J 1/16W	
R314			RK73GB1J273J	CHIP R 27K J 1/16W	
R315			RK73GB1J103J	CHIP R 10K J 1/16W	
R316			RK73GB1J101J	CHIP R 100 J 1/16W	
R317			R92-1252-05	CHIP R 0 OHM	
R318			RK73GB1J471J	CHIP R 470 J 1/16W	
R319			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R320			R92-1252-05	CHIP R 0 OHM	
R401			RK73GB1J103J	CHIP R 10K J 1/16W	
R402			RK73GB1J123J	CHIP R 12K J 1/16W	K2
R402			RK73GB1J223J	CHIP R 22K J 1/16W	K
R402			RK73GB1J822J	CHIP R 8.2K J 1/16W	HK,HK2
R403			RK73GB1J122J	CHIP R 1.2K J 1/16W	
R404			RK73GB1J473J	CHIP R 47K J 1/16W	
R405			R92-1252-05	CHIP R 0 OHM	
R406			RK73GB1J124J	CHIP R 120K J 1/16W	
R408			R92-1252-05	CHIP R 0 OHM	
R411			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R413			RK73GB1J473J	CHIP R 47K J 1/16W	
R414			R92-1252-05	CHIP R 0 OHM	
R501			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R502			RK73GB1J184J	CHIP R 180K J 1/16W	
R503			RK73GB1J223J	CHIP R 22K J 1/16W	
R504			RK73GB1J184J	CHIP R 180K J 1/16W	
R505			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R506			R92-1252-05	CHIP R 0 OHM	
R507,508			RK73GB1J154J	CHIP R 150K J 1/16W	
R509			RK73GB1J103J	CHIP R 10K J 1/16W	
R510			RK73GB1J105J	CHIP R 1.0M J 1/16W	
R511			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R512			RK73GB1J122J	CHIP R 1.2K J 1/16W	
R513			R92-1252-05	CHIP R 0 OHM	
R514			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R515			RN73GH1J913D	CHIP R 91K D 1/16W	
R516			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R517			RK73GB1J103J	CHIP R 10K J 1/16W	
R518			RN73GH1J333D	CHIP R 33K D 1/16W	
R519			RN73GH1J913D	CHIP R 91K D 1/16W	
R520			RN73GH1J683D	CHIP R 68K D 1/16W	
R521			RK73GB1J105J	CHIP R 1.0M J 1/16W	
R522			RN73GH1J913D	CHIP R 91K D 1/16W	
R523			RK73GB1J154J	CHIP R 150K J 1/16W	
R524			RN73GH1J274D	CHIP R 270K D 1/16W	
R525			RK73GB1J334J	CHIP R 330K J 1/16W	
R526			RK73GB1J154J	CHIP R 150K J 1/16W	
R527			RK73GB1J103J	CHIP R 10K J 1/16W	
R528			RK73GB1J153J	CHIP R 15K J 1/16W	
R529			R92-1252-05	CHIP R 0 OHM	
R530			RK73GB1J394J	CHIP R 390K J 1/16W	

PARTS LIST

TX-RX UNIT (X57-6480-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti- nation
R531			RK73GB1J473J	CHIP R 47K J 1/16W	
R532			RK73GB1J334J	CHIP R 330K J 1/16W	
R533			R92-1252-05	CHIP R 0 OHM	
R535			RK73GB1J155J	CHIP R 1.5M J 1/16W	
R536			RN73GH1J682D	CHIP R 6.8K D 1/16W	
R537,538			RK73GB1J473J	CHIP R 47K J 1/16W	
R540			RK73GB1J474J	CHIP R 470K J 1/16W	
R541			RK73GB1J274J	CHIP R 270K J 1/16W	
R542			RN73GH1J683D	CHIP R 68K D 1/16W	
R544			RK73GB1J101J	CHIP R 100 J 1/16W	
R545			RK73GB1J182J	CHIP R 1.8K J 1/16W	
R546			RK73GB1J224J	CHIP R 220K J 1/16W	
R547			RK73GB1J103J	CHIP R 10K J 1/16W	
R548			RK73GB1J183J	CHIP R 18K J 1/16W	
R550			RN73GH1J682D	CHIP R 6.8K D 1/16W	
R551			RK73GB1J223J	CHIP R 22K J 1/16W	
R552			RK73GB1J334J	CHIP R 330K J 1/16W	
R553			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R554			RK73GB1J332J	CHIP R 3.3K J 1/16W	
R555			RK73GB1J394J	CHIP R 390K J 1/16W	
R556			RK73GB1J223J	CHIP R 22K J 1/16W	
R558			R92-1252-05	CHIP R 0 OHM	
R562			RK73GB1J273J	CHIP R 27K J 1/16W	
R564			R92-1252-05	CHIP R 0 OHM	
R566			RK73GB1J470J	CHIP R 47 J 1/16W	
R567			RK73GB1J220J	CHIP R 22 J 1/16W	
R568			RK73GB1J473J	CHIP R 47K J 1/16W	
R569			RK73GB1J333J	CHIP R 33K J 1/16W	
R571,572			R92-1252-05	CHIP R 0 OHM	
R573			RK73GB1J104J	CHIP R 100K J 1/16W	
R574			RK73GB1J473J	CHIP R 47K J 1/16W	
R575			RK73GB1J103J	CHIP R 10K J 1/16W	
R576			RK73GB1J473J	CHIP R 47K J 1/16W	
R577			RK73GB1J153J	CHIP R 15K J 1/16W	
R579			R92-1252-05	CHIP R 0 OHM	
R580			RK73GB1J103J	CHIP R 10K J 1/16W	
R581			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R582			R92-1252-05	CHIP R 0 OHM	
R584			R92-1252-05	CHIP R 0 OHM	
R585,586			RK73GB1J473J	CHIP R 47K J 1/16W	
R587			R92-1252-05	CHIP R 0 OHM	
R588			RK73GB1J473J	CHIP R 47K J 1/16W	
R589			R92-1368-05	CHIP R 0 OHM	
R590-600			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R601-603			R92-1368-05	CHIP R 0 OHM	
R608-610			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R611			R92-1252-05	CHIP R 0 OHM	
R612			RK73GB1J224J	CHIP R 220K J 1/16W	
R613			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R614			R92-1252-05	CHIP R 0 OHM	
R615			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R616			RK73GB1J473J	CHIP R 47K J 1/16W	
R617,618			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R619			R92-1252-05	CHIP R 0 OHM	
R620			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R621			R92-1252-05	CHIP R 0 OHM	
R622,623			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R624			R92-1252-05	CHIP R 0 OHM	
R625-627			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R628,629			R92-1368-05	CHIP R 0 OHM	
R630			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R631			R92-1368-05	CHIP R 0 OHM	
R632			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R633			R92-1368-05	CHIP R 0 OHM	
R634			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R635			R92-1368-05	CHIP R 0 OHM	
R636,637			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R638			R92-1368-05	CHIP R 0 OHM	
R639			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R640			R92-1368-05	CHIP R 0 OHM	
R641			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R642			R92-1368-05	CHIP R 0 OHM	
R643			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R644			R92-1368-05	CHIP R 0 OHM	
R645			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R646,647			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R649			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R650-652			R92-1368-05	CHIP R 0 OHM	
R653,654			RK73HB1J102J	CHIP R 1.0K J 1/16W	
R655-657			R92-1368-05	CHIP R 0 OHM	
R658			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R659-666			R92-1368-05	CHIP R 0 OHM	
R667,668			RK73GB1J181J	CHIP R 180 J 1/16W	
R670			RK73GB1J473J	CHIP R 47K J 1/16W	
R672,673			RK73GB1J473J	CHIP R 47K J 1/16W	
R674			RK73FB2A222J	CHIP R 2.2K J 1/10W	
R675			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R676			RK73GB1J103J	CHIP R 10K J 1/16W	
R677			RK73GB1J223J	CHIP R 22K J 1/16W	
R678			RK73GB1J103J	CHIP R 10K J 1/16W	
R679			RK73FB2A390J	CHIP R 39 J 1/10W	
R680			RK73FB2A222J	CHIP R 2.2K J 1/10W	
R682			RK73GB1J473J	CHIP R 47K J 1/16W	
R683			RK73GB1J103J	CHIP R 10K J 1/16W	
R701			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R702			RK73GB1J101J	CHIP R 100 J 1/16W	
R705,706			RK73GB1J473J	CHIP R 47K J 1/16W	
R710,711			RK73GB1J104J	CHIP R 100K J 1/16W	
R712,713			RK73GB1J473J	CHIP R 47K J 1/16W	
R714			RK73GB1J103J	CHIP R 10K J 1/16W	
R716			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R718			RK73GB1J154J	CHIP R 150K J 1/16W	
R719			RK73GB1J103J	CHIP R 10K J 1/16W	
R720			RK73GB1J683J	CHIP R 68K J 1/16W	
R721			RK73GB1J334J	CHIP R 330K J 1/16W	
R722			RK73FB2A680J	CHIP R 68 J 1/10W	
R723			R92-1252-05	CHIP R 0 OHM	
R724			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R725			RK73GB1J562J	CHIP R 5.6K J 1/16W	
R726			R92-1252-05	CHIP R 0 OHM	
R727			RK73GB1J472J	CHIP R 4.7K J 1/16W	
VR1			R32-0658-05	SEMI FIXED VARIABLE RESISTOR	K,K2,HK
VR1			R32-0668-05	SEMI FIXED VARIABLE RESISTOR	HK2
D1-6			DA204U	DIODE	
D7			02DZ20(Y,Z)	ZENER DIODE	
D8,9			DA204U	DIODE	
D11			DAN202U	DIODE	
D12-14			DA204U	DIODE	
D15			DAN235E	DIODE	

PARTS LIST

TX-RX UNIT (X57-6480-XX)
PLL/VCO (X58-4540-11)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
D16			1SS355	DIODE	
D17			DA204U	DIODE	
D20			1SS355	DIODE	
D21			02DZ5.6(X,Y)	ZENER DIODE	
D22,23			DAN235E	DIODE	
D24			MINISMDC075-02	VARISTOR	
D26			1SS355	DIODE	
D27			HSM88AS	DIODE	
D28			02DZ15(X,Y)	ZENER DIODE	
D30			HSM88AS	DIODE	
D31			1SS355	DIODE	
D32			22ZR-10D	SURGE ABSORBER	
D34			02DZ18(X,Y)	ZENER DIODE	
D35			MA742	DIODE	
D36			DA221	DIODE	HK,HK2
D37			DSA3A1	DIODE	
D206-208			1SV282	VARIABLE CAPACITANCE DIODE	
D209,210			DA204U	DIODE	
D211			MA4PH633	DIODE	
D212,213			XB15A709	DIODE	
D501			DA204U	DIODE	
D502			MINISMDC075-02	VARISTOR	
D503-505			DA204U	DIODE	
D507			DAN202U	DIODE	
D508,509			MA742	DIODE	
D510			HSC119	DIODE	
D518			02DZ9.1(X,Y)	ZENER DIODE	
D520			MA2S111	DIODE	
IC1			TA75W01FU	MOS IC	
IC2,3			TA75W558FU	MOS IC	
IC4			TC4S66F	MOS IC	
IC5			M62363FP	MOS IC	
IC6			TA75W01FU	MOS IC	
IC7,8			BU4094BCFV	MOS IC	
IC9			TA78L05F	MOS IC	
IC10			LA4422	BI-POLAR IC	
IC11			TA31136FN	MOS IC	
IC12			TA78L05F	MOS IC	
IC13			AN8009M	MOS IC	
IC14			TA7808S	MOS IC	
IC15			TC4013BF(N)	MOS IC	
IC201			LMC7101BIM5	MOS IC	
IC202			GN2011(Q)	MOS IC	
IC300			SA7025DK	MOS IC	
IC400	2C		M67741H-32	HYBRID IC	K
IC400	2C		M67741L-35	HYBRID IC	K2
IC400	2C		M68702H	HYBRID IC	HK
IC400	2C		M68702L	HYBRID IC	HK2
IC401			NJM2904V	MOS IC	
IC501			TA75W558FU	MOS IC	
IC502			TC75W51FU	MOS IC	
IC503			TA75W558FU	MOS IC	
IC504			TC35453F	MOS IC	
IC506			BU4066BCFV	MOS IC	
IC507			LC73872M	MOS IC	
IC508			BU4094BCFV	MOS IC	
IC509			RH5VL42C	MOS IC	
IC510			AT29C020-90TI	ROM IC	
IC510			W29C020C90	SRAM IC	
IC511			30622M8A-4F9GP	MPU	

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
IC512			AT2408N10SI2.5	ROM IC	
IC512			24LC08BT-ISN	ROM IC	
IC513			TA78L05F	MOS IC	
IC710,711			TA75S01F	MOS IC	
Q1			2SK1824	FET	
Q2,3			2SC2412K(S)	TRANSISTOR	
Q4			DTD114EK	DIGITAL TRANSISTOR	
Q5,6			DTC114EE	DIGITAL TRANSISTOR	
Q7			2SC4215(Y)	TRANSISTOR	
Q8			DTC363EU	DIGITAL TRANSISTOR	
Q9			DTA114YUA	DIGITAL TRANSISTOR	
Q10			DTC114EE	DIGITAL TRANSISTOR	
Q11			2SA1362(Y)	TRANSISTOR	
Q12			2SB1132(Q,R)	TRANSISTOR	
Q13			DTC114EE	DIGITAL TRANSISTOR	
Q15			2SC2059K(P)	TRANSISTOR	
Q16			DTC144EE	DIGITAL TRANSISTOR	
Q17			2SC2412K(S)	TRANSISTOR	
Q18			2SK1824	FET	
Q19			2SD2394	TRANSISTOR	
Q20			2SB1188(Q)	TRANSISTOR	
Q21			FMW1	TRANSISTOR	
Q22			DTC114EE	DIGITAL TRANSISTOR	
Q23			DTA114EE	DIGITAL TRANSISTOR	
Q24			DTC144EE	DIGITAL TRANSISTOR	
Q25,26			DTA114EE	DIGITAL TRANSISTOR	
Q27			2SA1641(S,T)	TRANSISTOR	
Q28,29			DTC114EE	DIGITAL TRANSISTOR	
Q30			DTA114EE	DIGITAL TRANSISTOR	
Q31			DTC114EE	DIGITAL TRANSISTOR	
Q32			2SK1824	FET	
Q33			2SC2712(Y)	TRANSISTOR	HK,HK2
Q202,203			2SC3357	TRANSISTOR	
Q204			2SC2954	TRANSISTOR	
Q300			2SC4215(Y)	TRANSISTOR	
Q301,302			2SC3722K(S)	TRANSISTOR	
Q401-403			DTC114EE	DIGITAL TRANSISTOR	
Q501			DTC314TU	DIGITAL TRANSISTOR	
Q502			DTC144EE	DIGITAL TRANSISTOR	
Q503			2SC4617(S)	TRANSISTOR	
Q507			DTC144EE	DIGITAL TRANSISTOR	
Q508,509			2SC4617(S)	TRANSISTOR	
Q510			2SC4619	TRANSISTOR	
Q511			DTA144WE	DIGITAL TRANSISTOR	
Q512			DTC114EE	DIGITAL TRANSISTOR	
Q513			2SC2873(Y)	TRANSISTOR	
Q515			DTC114EE	DIGITAL TRANSISTOR	
TH1			157-104-53001	THERMISTOR	HK,HK2
PLL/VCO (X58-4540-11) : K2,HK2					
C102,103			CK73GB1H102K	CHIP C 1000PF K	K2,HK2
C104			CC73GCH1H330J	CHIP C 33PF J	K2,HK2
C105			CK73GB1H102K	CHIP C 1000PF K	K2,HK2
C107			CC73GCH1H150J	CHIP C 15PF J	K2,HK2
C108			CC73GCH1H270J	CHIP C 27PF J	K2,HK2
C109			CK73GB1C104K	CHIP C 0.10UF K	K2,HK2
C110			CK73GB1H102K	CHIP C 1000PF K	K2,HK2
C111			CK73FB1C474K	CHIP C 0.47UF K	K2,HK2
C112			CC73GCH1H020B	CHIP C 2.0PF B	K2,HK2
C113			CC73GCH1H080B	CHIP C 8.0PF B	K2,HK2

PARTS LIST

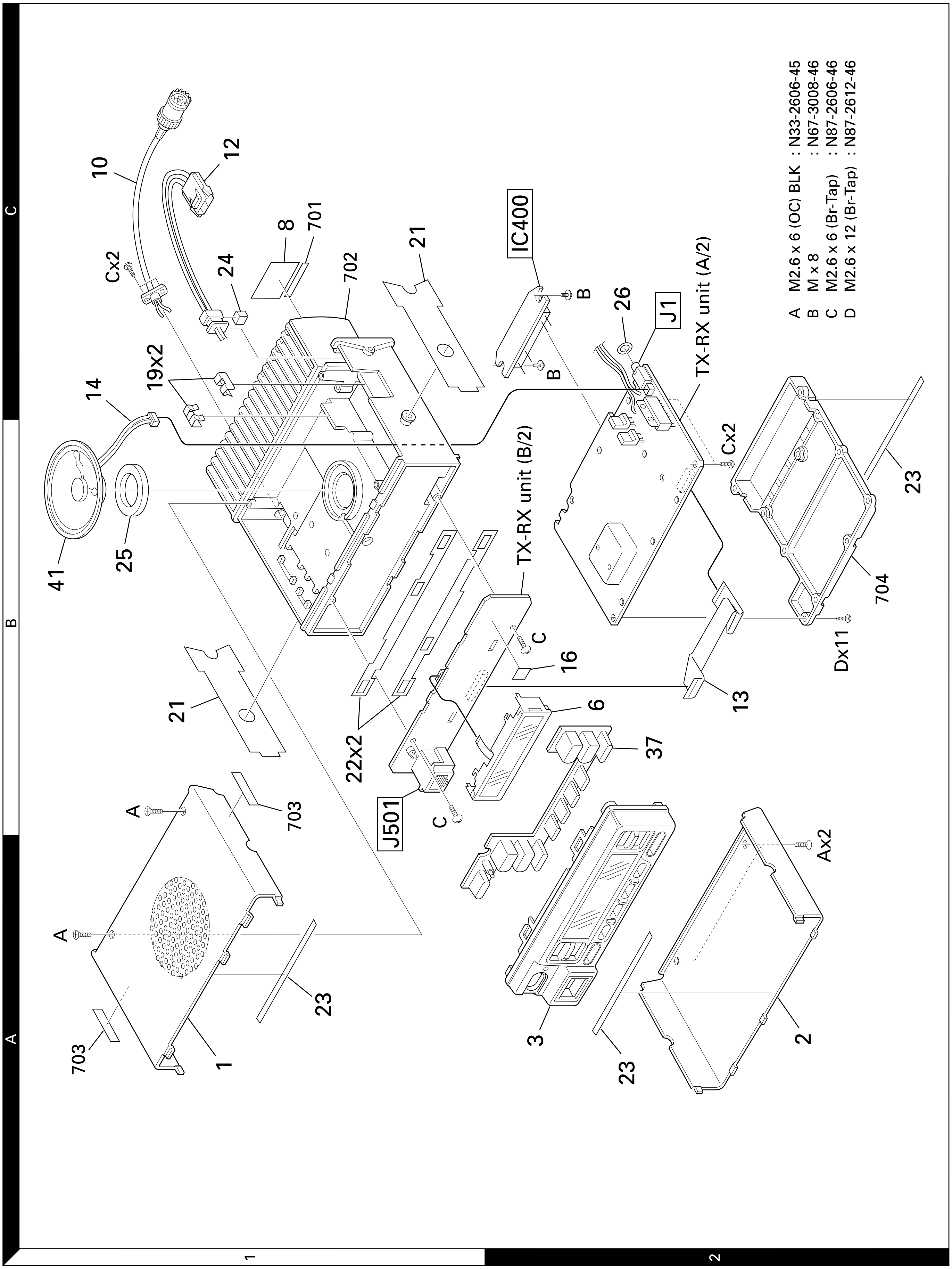
PLL/VCO (X58-4540-11)
PLL/VCO (X58-4712-70)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
C114			CK73GB1H471K	CHIP C 470PF K	K2,HK2
C115			CK73GB1H102K	CHIP C 1000PF K	K2,HK2
C117			CC73GCH1H090B	CHIP C 9.0PF B	K2,HK2
C119			CK73GB1H102K	CHIP C 1000PF K	K2,HK2
C120			CC73GCH1HR75B	CHIP C 0.75PF B	K2,HK2
C121			CK73GB1H102K	CHIP C 1000PF K	K2,HK2
C122			CC73GCH1H070B	CHIP C 7.0PF B	K2,HK2
C125,126			CC73GCH1H020B	CHIP C 2.0PF B	K2,HK2
C127			CK73GB1H102K	CHIP C 1000PF K	K2,HK2
C129			CK73GB1H102K	CHIP C 1000PF K	K2,HK2
C130			CC73GCH1H150J	CHIP C 15PF J	K2,HK2
C131			CC73GCH1H060B	CHIP C 6.0PF B	K2,HK2
C132			CC73GCH1H150J	CHIP C 15PF J	K2,HK2
C133,134			CK73GB1H102K	CHIP C 1000PF K	K2,HK2
C135			CC73GCH1H010B	CHIP C 1.0PF B	K2,HK2
C136			CC73GCH1H020B	CHIP C 2.0PF B	K2,HK2
C138			CC73GCH1H150J	CHIP C 15PF J	K2,HK2
C139			CK73GB1H102K	CHIP C 1000PF K	K2,HK2
C142			CK73GB1H102K	CHIP C 1000PF K	K2,HK2
C143			CC73GCH1H330J	CHIP C 33PF J	K2,HK2
TC101,102			C05-0384-05	CERAMIC TRIMMER CAP (10P)	K2,HK2
CN101			E40-5699-05	PIN ASSY	K2,HK2
-			F10-2279-04	SHIELDING CASE	K2,HK2
L101-104			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	K2,HK2
L105			L34-4522-05	AIR-CORE COIL	K2,HK2
L106			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	K2,HK2
L107			L34-4520-05	AIR-CORE COIL	K2,HK2
L109,110			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	K2,HK2
L111			L40-8271-34	SMALL FIXED INDUCTOR (82NH)	K2,HK2
R101			RK73GB1J101J	CHIP R 100 J 1/16W	K2,HK2
R102			RK73GB1J221J	CHIP R 220 J 1/16W	K2,HK2
R103			RK73GB1J102J	CHIP R 1.0K J 1/16W	K2,HK2
R104			RK73GB1J154J	CHIP R 150K J 1/16W	K2,HK2
R105			RK73GB1J221J	CHIP R 220 J 1/16W	K2,HK2
R106-110			RK73GB1J103J	CHIP R 10K J 1/16W	K2,HK2
R111			RK73GB1J331J	CHIP R 330 J 1/16W	K2,HK2
R113			RK73GB1J221J	CHIP R 220 J 1/16W	K2,HK2
R114			RK73GB1J271J	CHIP R 270 J 1/16W	K2,HK2
R115,116			RK73GB1J470J	CHIP R 47 J 1/16W	K2,HK2
R117			RK73GB1J473J	CHIP R 47K J 1/16W	K2,HK2
R118			RK73GB1J103J	CHIP R 10K J 1/16W	K2,HK2
R119			RK73GB1J101J	CHIP R 100 J 1/16W	K2,HK2
R120			RK73GB1J390J	CHIP R 39 J 1/16W	K2,HK2
R121			R92-1252-05	CHIP R 0 OHM	K2,HK2
D101-104			1SV283	VARIABLE CAPACITANCE DIODE	K2,HK2
D106,107			1SV283	VARIABLE CAPACITANCE DIODE	K2,HK2
D109			1SV214	VARIABLE CAPACITANCE DIODE	K2,HK2
Q101			DTC114EUA	DIGITAL TRANSISTOR	K2,HK2
Q102			2SK508NV(K52)	FET	K2,HK2
Q103			2SK508NV(K53)	FET	K2,HK2
Q104,105			2SC4081	TRANSISTOR	K2,HK2
Q106			2SC4215(Y)	TRANSISTOR	K2,HK2

PLL/VCO (X58-4712-70) : K,HK

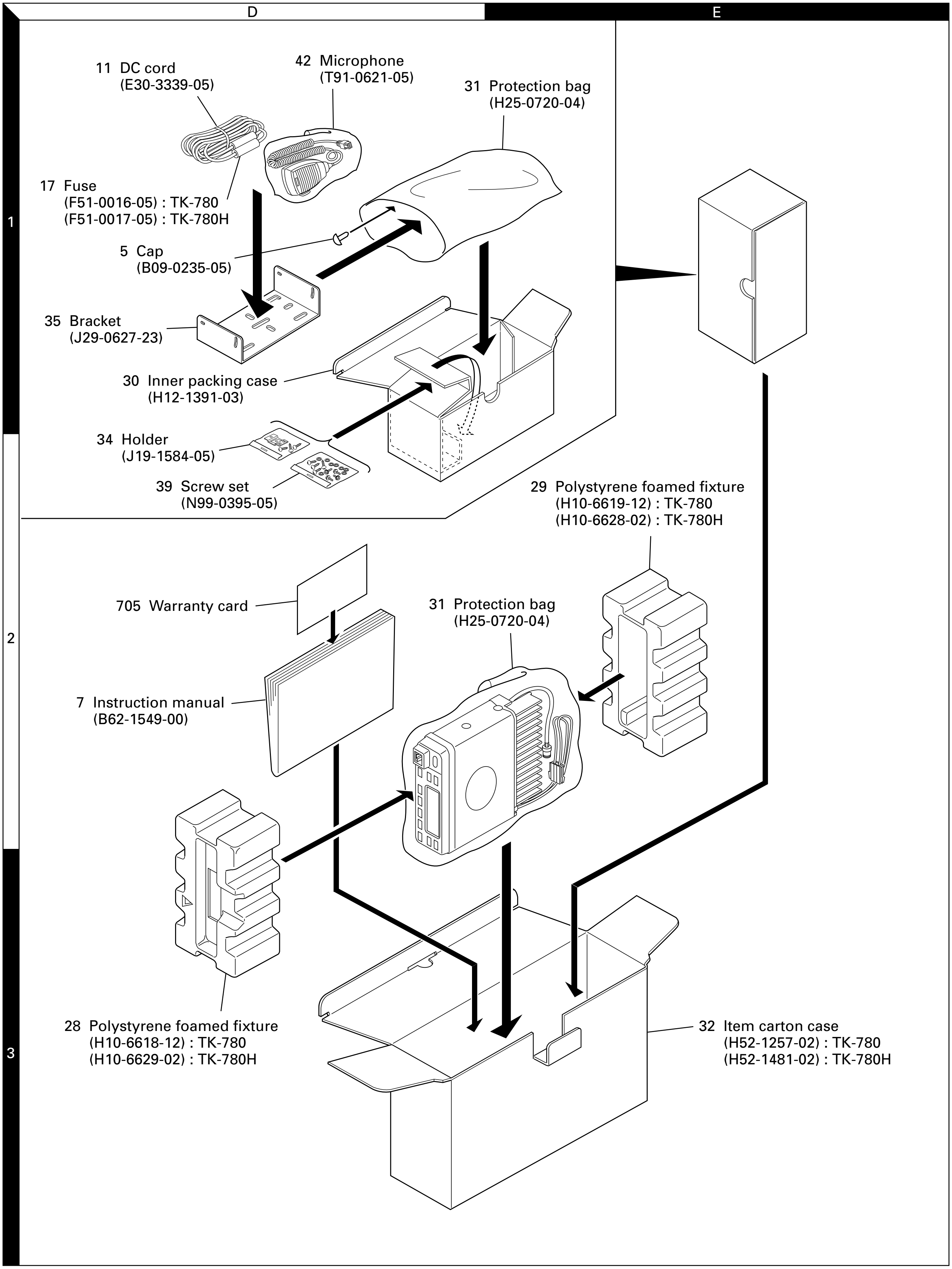
Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
C102,103			CK73GB1H102K	CHIP C 1000PF K	K,HK
C104			CC73GCH1H680J	CHIP C 68PF J	K,HK
C105			CK73GB1H102K	CHIP C 1000PF K	K,HK
C107			CC73GCH1H150J	CHIP C 15PF J	K,HK
C108			CC73GCH1H470J	CHIP C 47PF J	K,HK
C109			CK73GB1C104K	CHIP C 0.10UF K	K,HK
C110			CK73GB1H102K	CHIP C 1000PF K	K,HK
C111			CK73FB1C474K	CHIP C 0.47UF K	K,HK
C113			CC73GCH1H100D	CHIP C 10PF D	K,HK
C114			CK73GB1H471K	CHIP C 470PF K	K,HK
C115			CK73GB1H102K	CHIP C 1000PF K	K,HK
C117			CC73GCH1H060B	CHIP C 6.0PF B	K,HK
C119			CK73GB1H102K	CHIP C 1000PF K	K,HK
C120			CC73GCH1HR75B	CHIP C 0.75PF B	K,HK
C121			CK73GB1H102K	CHIP C 1000PF K	K,HK
C122			CC73GCH1H080B	CHIP C 8.0PF B	K,HK
C125,126			CC73GCH1H020B	CHIP C 2.0PF B	K,HK
C127			CK73GB1H102K	CHIP C 1000PF K	K,HK
C129			CK73GB1H102K	CHIP C 1000PF K	K,HK
C130,131			CC73GCH1H060B	CHIP C 6.0PF B	K,HK
C132			CC73GCH1H120J	CHIP C 12PF J	K,HK
C133,134			CK73GB1H102K	CHIP C 1000PF K	K,HK
C135,136			CC73GCH1H020B	CHIP C 2.0PF B	K,HK
C138			CC73GCH1H150J	CHIP C 15PF J	K,HK
C139			CK73GB1H102K	CHIP C 1000PF K	K,HK
C142			CK73GB1H102K	CHIP C 1000PF K	K,HK
TC101,102			C05-0384-05	CERAMIC TRIMMER CAP (10P)	K,HK
CN101			E40-5699-05	PIN ASSY	K,HK
-			F10-2279-04	SHIELDING CASE	K,HK
L101-104			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	K,HK
L105			L40-6878-67	SMALL FIXED INDUCTOR (68NH)	K,HK
L106			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	K,HK
L107			L40-3978-67	SMALL FIXED INDUCTOR (39NH)	K,HK
L109,110			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	K,HK
L111			L40-4778-67	SMALL FIXED INDUCTOR (47NH)	K,HK
R101,102			RK73GB1J470J	CHIP R 47 J 1/16W	K,HK
R103			RK73GB1J102J	CHIP R 1.0K J 1/16W	K,HK
R104			RK73GB1J154J	CHIP R 150K J 1/16W	K,HK
R105			RK73GB1J221J	CHIP R 220 J 1/16W	K,HK
R106			RK73GB1J222J	CHIP R 2.2K J 1/16W	K,HK
R107-110			RK73GB1J103J	CHIP R 10K J 1/16W	K,HK
R111			RK73GB1J151J	CHIP R 150 J 1/16W	K,HK
R113			RK73GB1J221J	CHIP R 220 J 1/16W	K,HK
R114			RK73GB1J271J	CHIP R 270 J 1/16W	K,HK
R115,116			RK73GB1J470J	CHIP R 47 J 1/16W	K,HK
R117			RK73GB1J473J	CHIP R 47K J 1/16W	K,HK
R118			RK73GB1J103J	CHIP R 10K J 1/16W	K,HK
R119			RK73GB1J101J	CHIP R 100 J 1/16W	K,HK
R120			RK73GB1J390J	CHIP R 39 J 1/16W	K,HK
R121,122			R92-1252-05	CHIP R 0 OHM	K,HK
D101,102			1SV283	VARIABLE CAPACITANCE DIODE	K,HK
D104			1SV283	VARIABLE CAPACITANCE DIODE	K,HK
D107			1SV283	VARIABLE CAPACITANCE DIODE	K,HK
D109			1SV214	VARIABLE CAPACITANCE DIODE	K,HK
Q101			DTC114EUA	DIGITAL TRANSISTOR	K,HK
Q102			2SK508NV(K52)	FET	K,HK
Q103			2SK508NV(K53)	FET	K,HK
Q104,105			2SC4081	TRANSISTOR	K,HK
Q106			2SC4215(Y)	TRANSISTOR	K,HK

EXPLODED VIEW



Parts with the exploded numbers larger than 700 are not supplied.

PACKING



Parts with the exploded numbers larger than 700 are not supplied.

ADJUSTMENT

Test Mode

■ Test Mode Operating Features

This transceiver has a test mode. ***To enter test mode, press [A] key and turn power on. Hold [A] key until test channel No. and test signalling No. appears on LCD.*** Test mode can be inhibited by programming. To exit test mode, switch the power on again. The following functions are available in test mode.

- **Controls ("FCN" appears)**

[PTT]	Used when making a transmission.
[MON]	Monitor on and off.
[SCN]	MSK 1200 bps and 2400 bps.
[A]	Function off.
[B]	Compander function on and off.
[C]	Beat shift on and off.
[D]	Function off.
[System Up/Down] (Trunking format)	Changes channel.
[Group Up/Down] (Conventional format)	Changes channel.
[Volume Up/Down]	Volume up/down.

- **Controls ("FCN" not appears)**

[PTT]	Used when making a transmission.
[MON]	Monitor on and off.
[SCN]	Sets to the tuning mode.
[A]	Function on.
[B]	RF power high and low.
[C]	Changes signalling.
[D]	Changes wide and narrow
[System Up/Down] (Trunking format)	Changes channel.
[Group Up/Down] (Conventional format)	Changes channel.
[Volume Up/Down]	Volume up/down.

Note : If a [SCN], [A], [B], [C] key is pressed during transmission, the DTMF corresponding to the key that was pressed is sent.

- **LCD indicator**

"SCN"	Unused
"✆"	Lights at compander on.
"AUX"	Unused.
"P"	Lights at RF power low.
"MON"	Lights at monitor on.
"SVC"	Unused.
"✉"	Lights at MSK 2400 bps.

- **LED indicator**

Red LED	Lights during transmission.
Green LED	Lights when there is a carrier.

- **Sub LCD indicator**

"FCN"	Appears at function on.
"n"	Appears at narrow on.

■ Frequency and Signalling

The set has been adjusted for the frequencies shown in the following table. When required, re-adjust them following the adjustment procedure to obtain the frequencies you want in actual operation.

- **Frequency (MHz)**

Channel No.	K,HK		K2,HK2	
	RX	TX	RX	TX
1	160.050	160.100	149.050	149.100
2	146.050	146.100	136.050	136.100
3	173.950	173.900	161.950	161.900
4	160.000	160.000	149.000	149.000
5	160.200	160.200	149.200	149.200
6	160.400	160.400	149.400	149.400
7~16	–	–	–	–

- **Signalling**

Signalling No.	RX	TX
1	None	None
2	None	100Hz square
3	LTR data	LTR data
4	QT 67.0Hz	QT 67.0Hz
5	QT 151.4Hz	QT 151.4Hz
6	QT 210.7Hz	QT 210.7Hz
7	QT 250.3Hz	QT 250.3Hz
8	DQT D023N	DQT D023N
9	DQT D754I	DQT D754I
10	DTMF DEC, (159D)	DTMF ENC, (159D)
11	None	DTMF tone 9
12	2-tone 321.7/928.1Hz	None
13	Single tone 1200Hz	Single tone 1200Hz
14	None	MSK
15	MSK code	MSK code

- **Preparations for tuning the transceiver**

Before attempting to tune the transceiver, connect the unit to a suitable power supply.

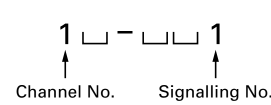
Whenever the transmitter is turned, the unit must be connected to a suitable dummy load (i.e. power meter).

The speaker output connector must be terminated with a 4Ω dummy load and connected to an AC voltmeter and an audio distortion meter or a SINAD measurement meter at all times during tuning.

- **Transceiver tuning (To place transceiver in tuning mode)**

Channel appears on LCD. Set channel according to tuning requirements.

LCD display (Test mode)



ADJUSTMENT

Press [SCN], now in tuning mode. Use [B] button to write tuning data through tuning modes, and [System Up/Down] : Trunking format, [Group Up/Down] : Conventional format to adjust tuning requirements (1 to 256 appears on LCD).

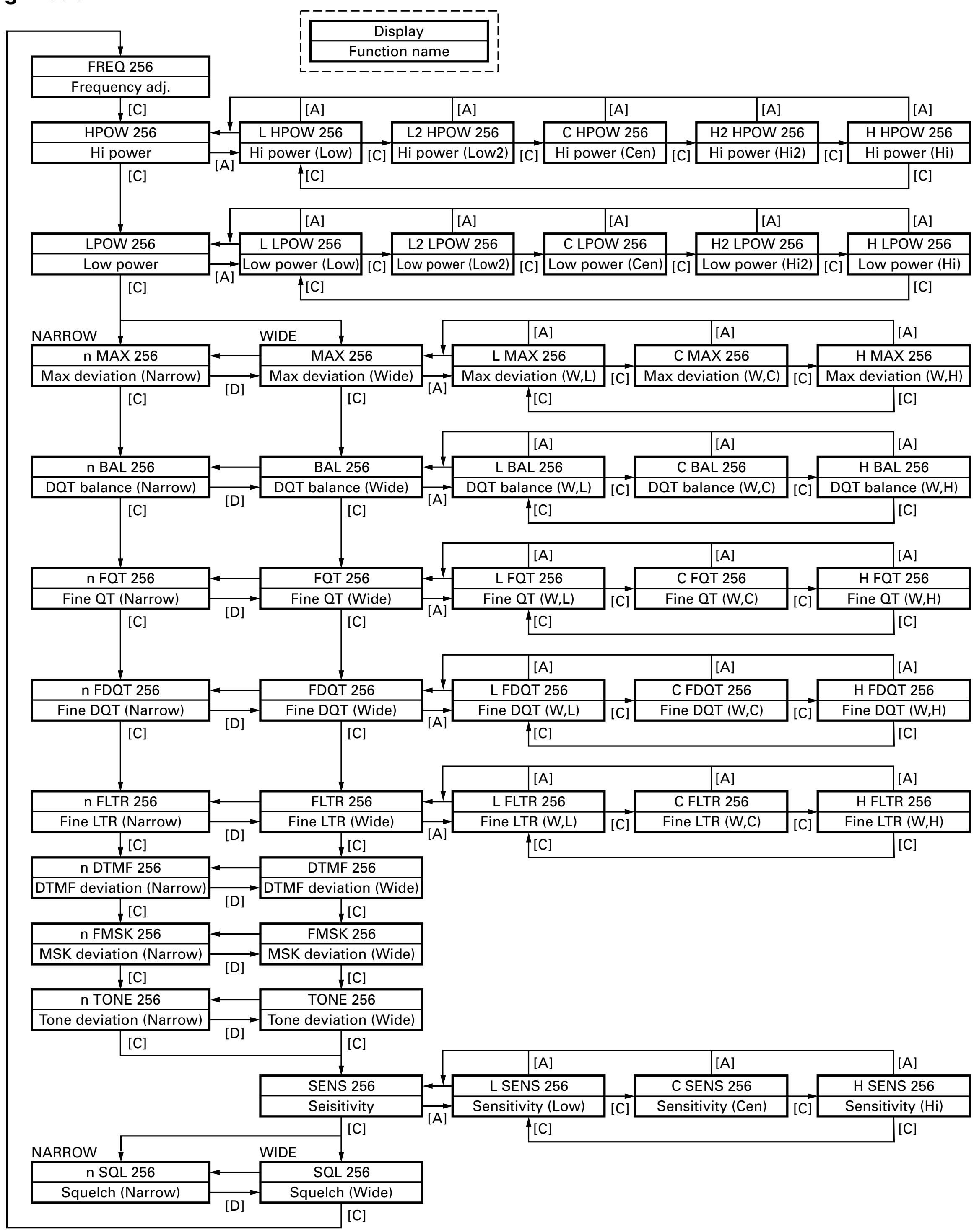
Use [C] button to select the adjustment item through tuning modes. Use [A] button to adjust 3-point or 5-point tuning, and use [D] button to switch between wide/narrow.

LCD display (Tuning mode)

F R E Q␣␣␣ 1

Adjustment item Adjustment (1~256)

■ Tuning Mode



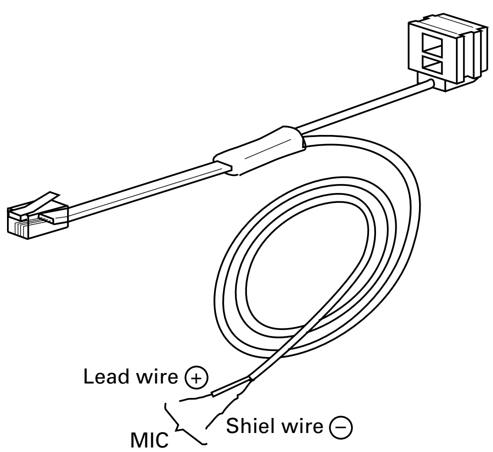
ADJUSTMENT

Test Equipment Required for Alignment

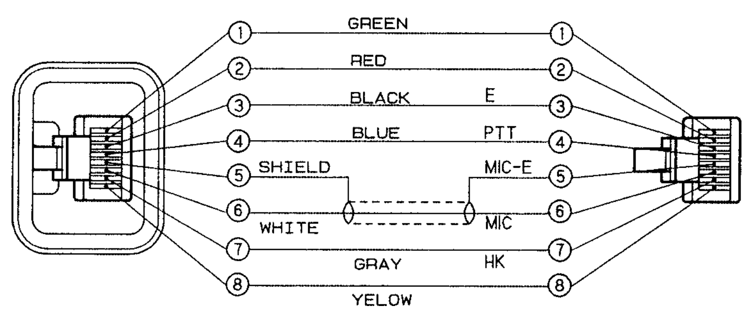
Test Equipment	Major Specifications	
1. Standard Signal Generator (SSG)	Frequency Range Modulation Output	136 to 174MHz Frequency modulation and external modulation –127dBm/0.1µV to greater than –7dBm/100mV
2. Power Meter	Input Impedance Operation Frequency Measurement Capability	50Ω 136 to 174MHz or more Vicinity of 100W
3. Deviation Meter	Frequency Range	136 to 174MHz
4. Digital Volt Meter (DVM)	Measuring Range Accuracy	1 to 20V DC High input impedance for minimum circuit loading
5. Oscilloscope		DC through 30MHz
6. High Sensitivity Frequency Counter	Frequency Range Frequency Stability	10Hz to 1000MHz 0.2ppm or less
7. Ammeter		20A
8. AF Volt Meter (AF VTVM)	Frequency Range Voltage Range	50Hz to 10kHz 1mV to 20V
9. Audio Generator (AG)	Frequency Range Output	20Hz to 20kHz or more 0 to 1V
10. Distortion Meter	Capability Input Level	3% or less at 1kHz 50mV to 10Vrms
11. 4Ω Dummy Load		Approx. 4Ω, 10W or more
12. Regulated Power Supply		13.6V, approx. 20A (adjustable from 9 to 20V) Useful if ammeter requipped

Tuning cable (E30-3383-05)

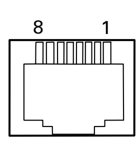
Adapter cable (E30-3383-05) is required for injecting an audio if PC tuning is used.
See "PC Mode" section for the connection.



Test cable for microphone input (E30-3360-08)



MIC connector
(Front view)

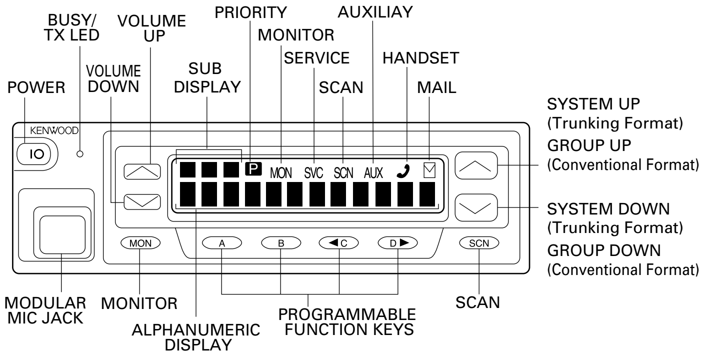


1 : BLC
2 : PSB
3 : E
4 : PTT
5 : ME
6 : MIC
7 : HOOK
8 : CM

ADJUSTMENT

Adjustment Location

■ Switch



■ Note

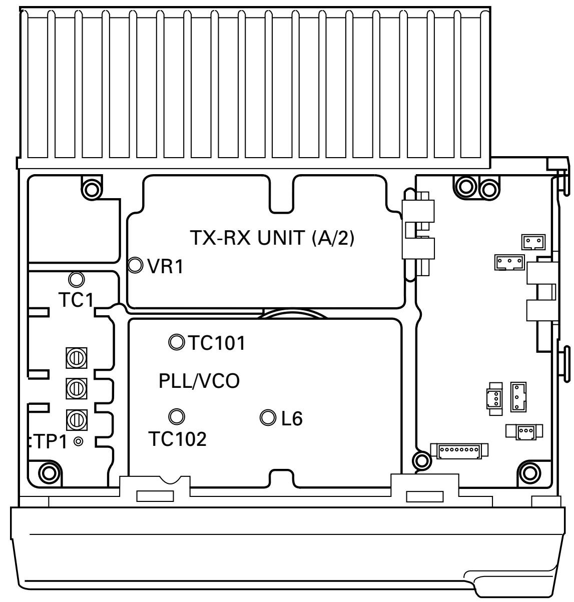
- **Flash memory**

The firmware program (User mode, Test mode, Tuning mode, etc.) and the data programmed by the FPU (KPG-49D) for the flash memory, is stored in memory. When parts are changed, program the data again.

- **EEPROM**

The tuning data (Deviation, Squelch, etc.) for the EEPROM, is stored in memory. When parts are changed, readjust the transceiver.

■ Adjustment Point



Repair Jig (Chassis)

Use jig (Part No. : A10-4010-02) for repairing the TK-780/780H. The jig facilitates the voltage check when the voltage on the component side TX-RX unit (A/2) is checked during repairs.

Common Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. PLL lock voltage	1) Set test mode CH : CH3 - Sig1 AUX : ON (Talk-around mode) PTT : ON (Transmit)	DVM Power meter F. conter	TX-RX (A/2)	TP1	PLL	TC101	1.5V	±0.1V
						TC102	1.5V	
	2) CH : CH2 - Sig1 PTT : ON (Transmit)						Check	8.0V or less

ADJUSTMENT

Receiver Section

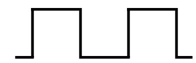
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Discriminator	1) Set test mode CH : CH1 - Sig1 - Narrow SSG output : –53dBm AF : 0.45V/4Ω	SSG AF VTVM Oscilloscope	Rear panel	ANT ACC (EXT.SP)	TX-RX (A/2)	L6	AF output maximum.	Maximum point +0mV, –20mV.
2. Sensitivity	1) Set test mode Select "SENS" in tuning mode. "L SENS" SSG freq' K, HK : 146.050MHz K2,HK2 : 136.050MHz SSG output : –118dBm/0.31µV SSG MOD : 3kHz AF output : 1V/4Ω	SSG AF VTVM Distortion meter Oscilloscope AG		ANT ACC (EXT.SP)			Adjust for maximum SINAD.	
	2) "C SENS" SSG freq' K,HK : 160.050MHz K2,HK2 : 149.050MHz						Adjust for maximum SINAD.	
	3) "H SENS" SSG freq' K,HK : 173.950MHz K2,HK2 : 161.950MHz						Adjust for maximum SINAD.	
3. Squelch	1) Set test mode Select "SQL" in tuning mode. SSG freq' K,HK : 160.050MHz K2,HK2 : 149.050MHz SSG output : Value of 12dB SINAD SSG MOD : 3kHz (Wide) 1.5kHz (Narrow)						Squelch closed once. Then squelch must be opened.	
4. Image response (HK only)	1) Set test mode CH : CH2 - Sig1 Wide or Narrow SSG output : –30dBm SSG freq' : 235.750MHz SSG MOD : OFF SQ : OFF				TX-RX (A/2)	TC1	Adjust for maximum noise level	
5. Squelch check	1) Set test mode CH : CH1 - Sig1 SSG output : 15dB SINAD level						Check	Squelch must be opened. (Wide/Narrow)
	2) SSG output : OFF							Squelch must be closed. (Wide/Narrow)
6. QT check	1) Set test mode CH : CH1 - Sig5 SSG MOD INT : 1kHz EXT : 151.4Hz SSG system MOD DEV : ±3.75kHz SSG output : 10dB SINAD level							
	2) CH : CH1 - Sig4 CH1 - Sig6 CH1 - Sig7						Check	Squelch must be closed.

ADJUSTMENT

Transmitter Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Frequency	1) Set test mode Select "FREQ" in tuning mode. PTT : ON	Power meter F. counter	Rear panel	ANT			Check	K,HK : 160.100MHz±100Hz K2,HK2 : 149.100MHz±100Hz
2. Power output	1) Maximum power Set test mode Select "H POW" in tuning mode. "L HPOW 256" : K2,HK "H HPOW 256" : K,HK2 PTT : ON				TX-RX (A/2)	VR1	27.0W : K,K2 50.0W : HK,HK2	±0.5W : K,K2 ±2.0W : HK,HK2
3. High power	1) Set test mode Select "H POW" in tuning mode. "L HPOW" PTT : ON						25.0W : K,K2 45.0W : HK,HK2	±1.0W : K,K2 ±2.0W : HK,HK2
	2) "L2 HPOW" PTT : ON							
	3) "C HPOW" PTT : ON							
	4) "H2 HPOW" PTT : ON							
	5) "H HPOW" PTT : ON							
4. Low power	1) Set test mode Select "L POW" in tuning mode. "L LPOW" PTT : ON	Power meter					5.0W : K,K2 10.0W : HK,HK2	±0.5W : K,K2 ±1.0W : HK,HK2
	2) "L2 LPOW" PTT : ON							
	3) "C LPOW" PTT : ON							
	4) "H2 LPOW" PTT : ON							
	5) "H LPOW" PTT : ON							
5. Power check	1) Set test mode CH : CH1 - Sig1 CH2 - Sig1 CH3 - Sig1 PTT : ON	Power meter Ammeter		ANT DC IN			Check	25W±1W, 7A or less : K,K2 45W±2W, 12A or less : HK,K2

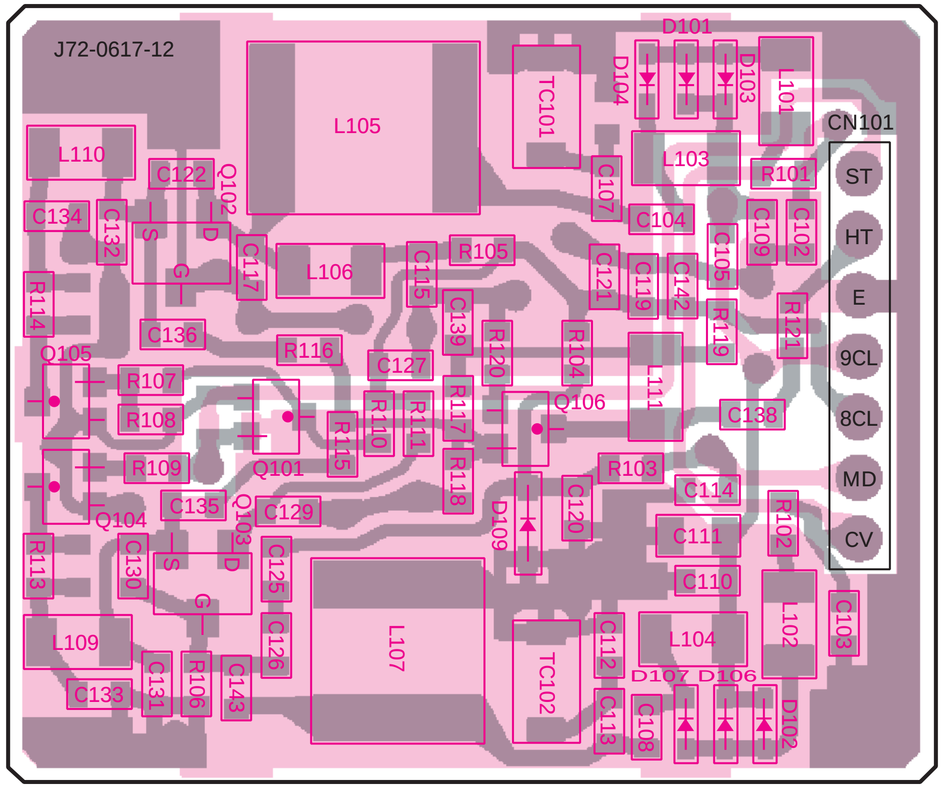
ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
6. Modulation balanced	1) Set test mode MIC input : OFF Select "BAL" in tuning mode. "L BAL" Deviation meter filter LPF : 15kHz HPF : OFF De-emphasis : OFF	Power meter Deviation meter Oscilloscope AF VTVM AG	Rear panel Front panel	ANT MIC			Make the de-modulation waveform neat.	(Wide/Narrow) 
	2) "C BAL" PTT : ON							
	3) "H BAL" PTT : ON							
7. Maximum deviation	1) Set test mode Connect AG to the MIC terminal. Select "MAX" in tuning mode. "L MAX" AG : 1kHz/50mV Deviation meter filter LPF : 15kHz HPF : OFF De-emphasis : OFF PTT : ON						3.8kHz (Wide) 1.75kHz (Narrow) (According to the larger +, –)	±50Hz (Wide/Narrow)
	2) "C MAX" PTT : ON							
	3) "H MAX" PTT : ON							
8. MIC seisitivity check	1) Set test mode CH : CH1 - Sig1 AG : 1kHz/5mV PTT : ON						Check	±3kHz±0.2kHz (Wide) ±1.5kHz±0.05kHz (Narrow)
9. QT deviation	1) Set test mode Select "FQT" in tuning mode. "L FQT" Deviation meter filter LPF : 3kHz HPF : OFF PTT : ON						0.75kHz (Wide) 0.35kHz (Narrow)	±50Hz (Wide/Narrow)
	2) "C FQT" PTT : ON							
	3) "H FQT" PTT : ON							
10. DQT deviation	1) Set test mode Select "F DQT" in tuning mode. "L FDQT" Deviation meter filter LPF : 3kHz HPF : OFF PTT : ON						0.75kHz (Wide) 0.35kHz (Narrow)	±50Hz (Wide/Narrow)
	2) "C FDQT" PTT : ON							
	3) "H FDQT" PTT : ON							

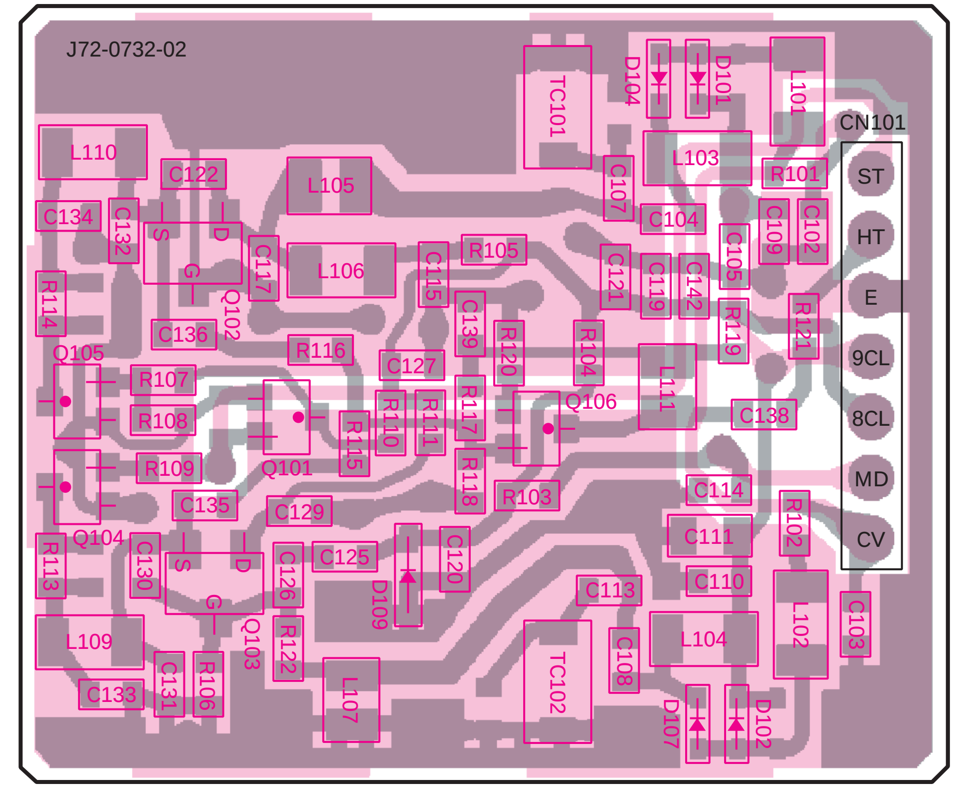
ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
11. Fine LTR	1) Set test mode Select "FLTR" in tuning mode. "L FLTR" deviation meter filter LPF : 3kHz HPF : OFF PTT : ON	Power meter Deviation meter Oscilloscope AF VTVM AG	Rear panel Front panel	ANT MIC			1.0kHz (Wide) 0.75kHz (Narrow)	±50Hz (Wide/Narrow)
	2) "C FLTR" PTT : ON							
	3) "H FLTR" PTT : ON							
12. DTMF deviation	1) Set test mode Select "DTMF" in tuning mode. Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						3.0kHz (Wide) 1.5kHz (Narrow)	±0.2kHz (Wide) ±0.1kHz (Narrow)
13. MSK deviation	1) Set test mode Select "FMSK" in tuning mode. Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						3.0kHz (Wide) 1.5kHz (Narrow)	±0.1kHz (Wide/Narrow)
14. TONE deviation	1) Set test mode Select "TONE" in tuning mode. Deviation meter filter LPF : 15kHz HPF : OFF PTT : ON						3.0kHz (Wide) 1.5kHz (Narrow)	±0.1kHz (Wide/Narrow)

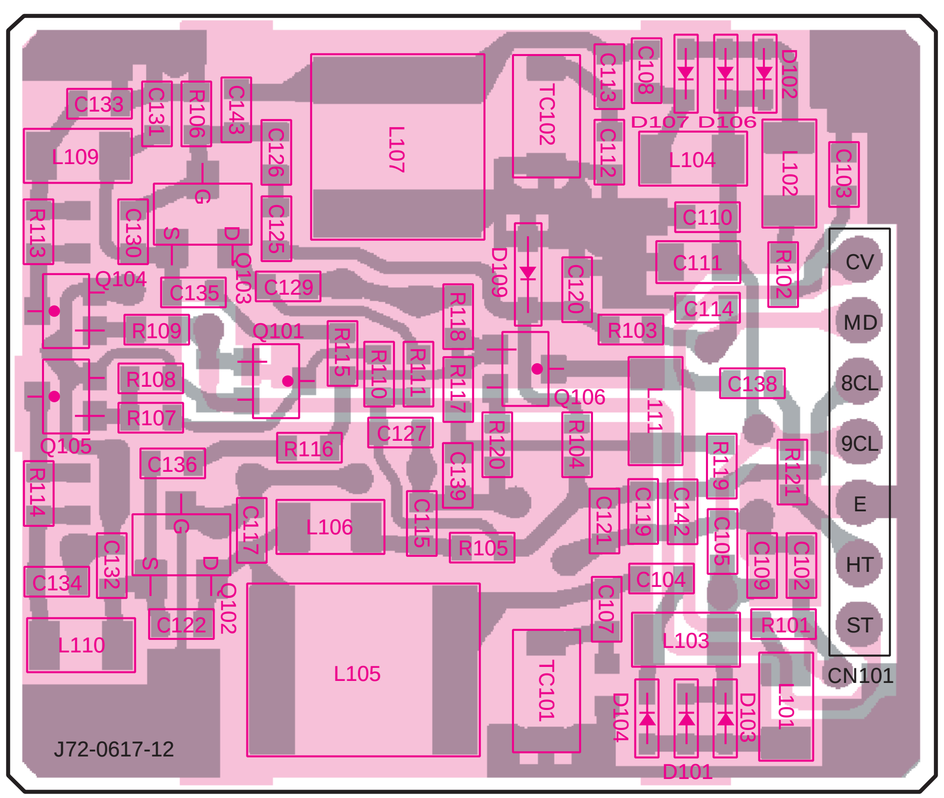
PLL/VCO (X58-4540-11) Component side view : K2, HK2



PLL/VCO (X58-4712-70) Component side view : K, HK

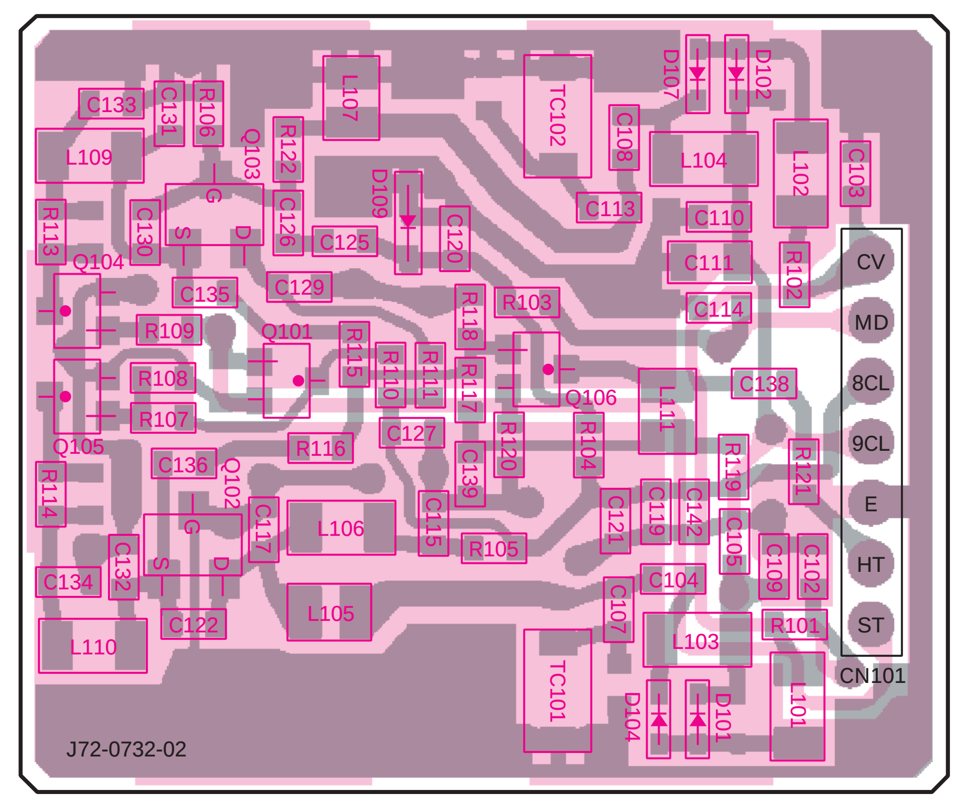


PLL/VCO (X58-4540-11) Foil side view : K2, HK2



Component side
Foil side

PLL/VCO (X58-4712-70) Foil side view : K, HK



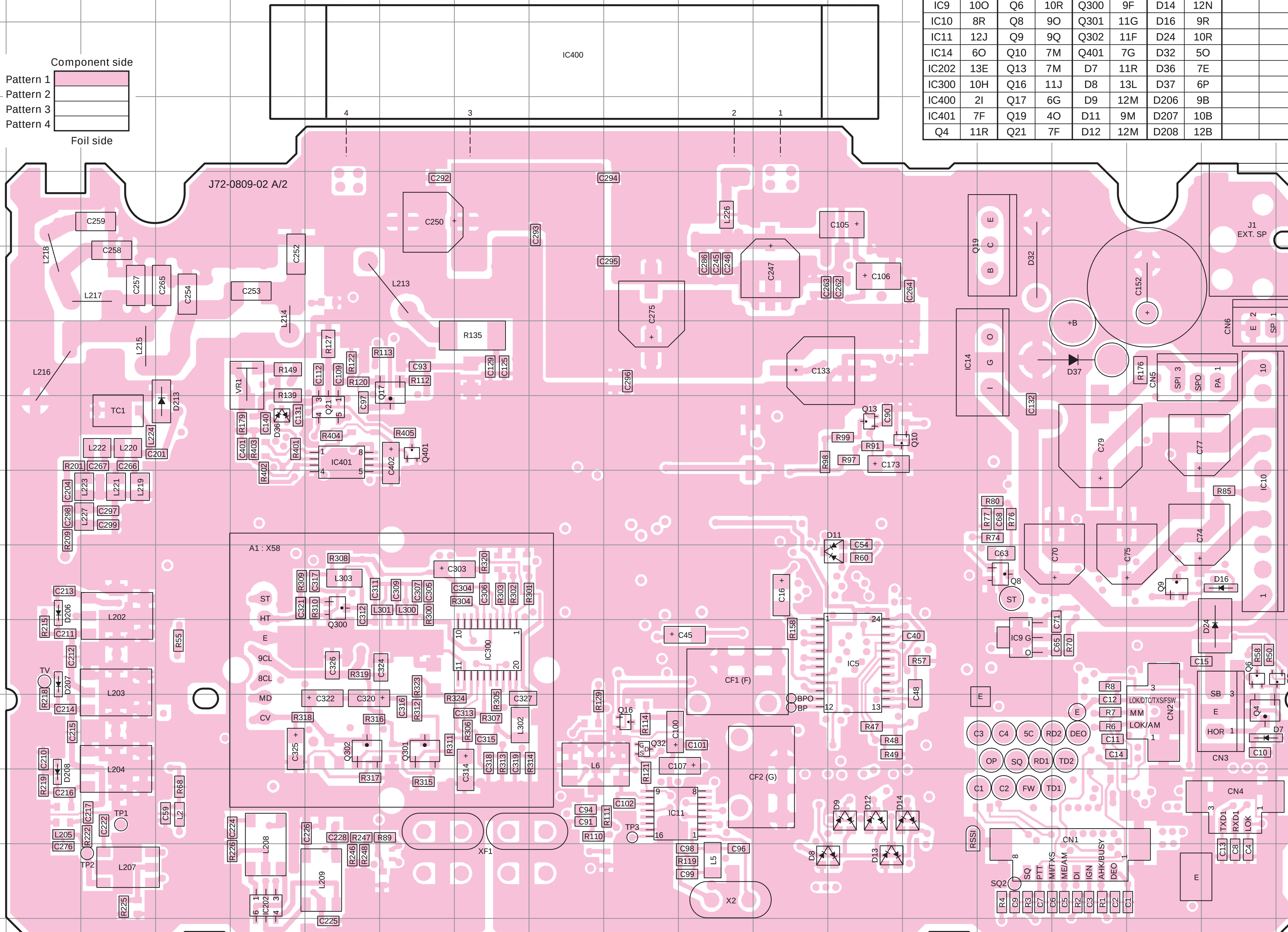
Component side
Foil side

TK-780/H PC BOARD VIEW

TX-RX UNIT (X57-6480-XX) (A/2) Component side view
-10 : K -11 : K2 -12 : HK -13 : HK2

Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address
IC5	10M	Q5	10S	Q32	11J	D13	13M	D213	7D
IC9	10O	Q6	10R	Q300	9F	D14	12N		
IC10	8R	Q8	9O	Q301	11G	D16	9R		
IC11	12J	Q9	9Q	Q302	11F	D24	10R		
IC14	6O	Q10	7M	Q401	7G	D32	5O		
IC202	13E	Q13	7M	D7	11R	D36	7E		
IC300	10H	Q16	11J	D8	13L	D37	6P		
IC400	2I	Q17	6G	D9	12M	D206	9B		
IC401	7F	Q19	4O	D11	9M	D207	10B		
Q4	11R	Q21	7F	D12	12M	D208	12B		

Component side
Pattern 1
Pattern 2
Pattern 3
Pattern 4
Foil side

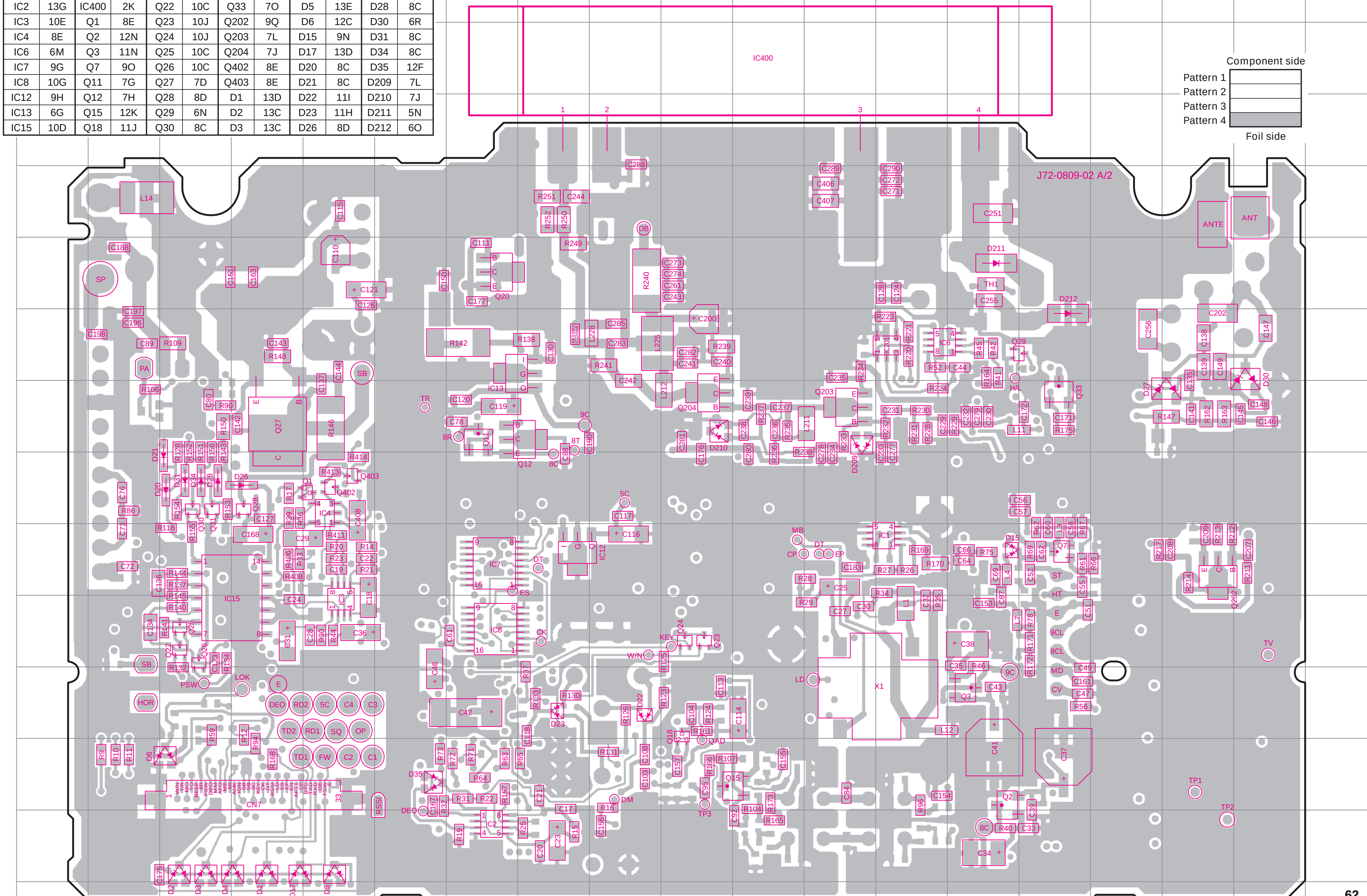


PC BOARD VIEW TK-780/H

TX-RX UNIT (X57-6480-XX) (A/2) Foil side view
-10 : K -11 : K2 -12 : HK -13 : HK2

Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address
IC1	9M	IC201	6M	Q20	5G	Q31	8C	D4	13D	D27	7Q
IC2	13G	IC400	2K	Q22	10C	Q33	7O	D5	13E	D28	8C
IC3	10E	Q1	8E	Q23	10J	Q202	9Q	D6	12C	D30	6R
IC4	8E	Q2	12N	Q24	10J	Q203	7L	D15	9N	D31	8C
IC6	6M	Q3	11N	Q25	10C	Q204	7J	D17	13D	D34	8C
IC7	9G	Q7	9O	Q26	10C	Q402	8E	D20	8C	D35	12F
IC8	10G	Q11	7G	Q27	7D	Q403	8E	D21	8C	D209	7L
IC12	9H	Q12	7H	Q28	8D	D1	13D	D22	11I	D210	7J
IC13	6G	Q15	12K	Q29	6N	D2	13C	D23	11H	D211	5N
IC15	10D	Q18	11J	Q30	8C	D3	13C	D26	8D	D212	6O

Component side
Pattern 1
Pattern 2
Pattern 3
Pattern 4
Foil side



TK-780/H PC BOARD VIEW

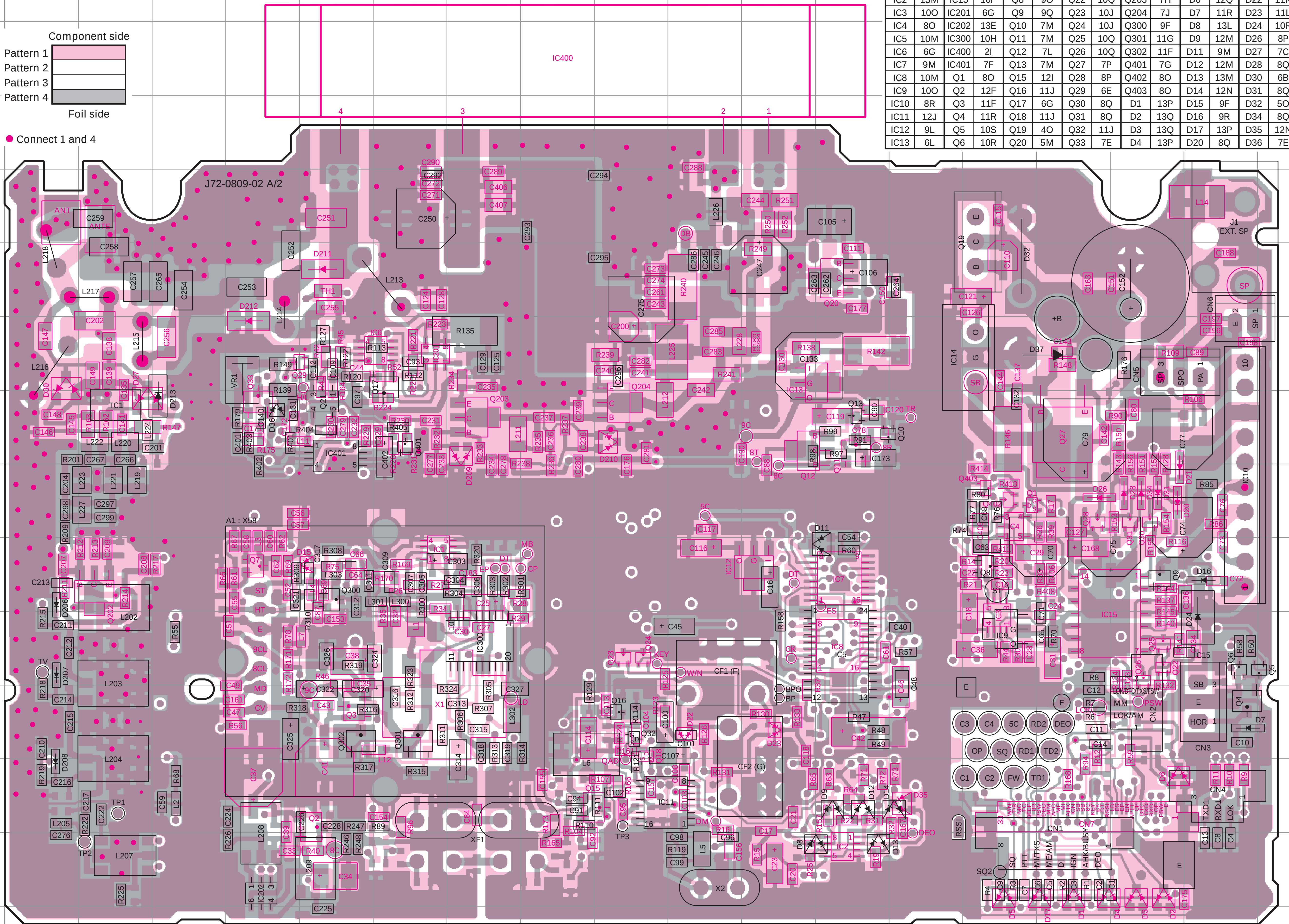
TX-RX UNIT (X57-6480-XX) (A/2) Component side view + Foil side
-10 : K -11 : K2 -12 : HK -13 : HK2

Component side
- Pattern 1
- Pattern 2
- Pattern 3
- Pattern 4

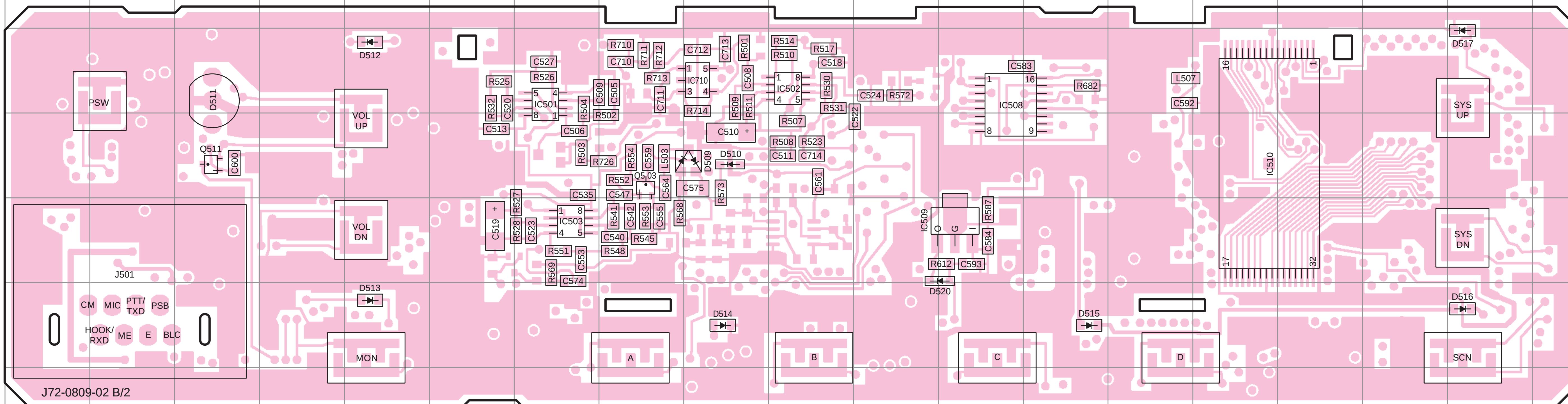
Foil side

● Connect 1 and 4

Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address
IC1	9G	IC14	6O	Q7	9E	Q21	7F	Q202	9C	D5	13O	D21	8Q	D37	6P
IC2	13M	IC15	10P	Q8	9O	Q22	10Q	Q203	7H	D6	12Q	D22	11K	D206	9B
IC3	10O	IC201	6G	Q9	9Q	Q23	10J	Q204	7J	D7	11R	D23	11L	D207	10B
IC4	8O	IC202	13E	Q10	7M	Q24	10J	Q300	9F	D8	13L	D24	10R	D208	12B
IC5	10M	IC300	10H	Q11	7M	Q25	10Q	Q301	11G	D9	12M	D26	8P	D209	7H
IC6	6G	IC400	2I	Q12	7L	Q26	10Q	Q302	11F	D11	9M	D27	7C	D210	7J
IC7	9M	IC401	7F	Q13	7M	Q27	7P	Q401	7G	D12	12M	D28	8Q	D211	5F
IC8	10M	Q1	8O	Q15	12I	Q28	8P	Q402	8O	D13	13M	D30	6B	D212	6E
IC9	10O	Q2	12F	Q16	11J	Q29	6E	Q403	8O	D14	12N	D31	8Q	D213	7D
IC10	8R	Q3	11F	Q17	6G	Q30	8Q	D1	13P	D15	9F	D32	5O		
IC11	12J	Q4	11R	Q18	11J	Q31	8Q	D2	13Q	D16	9R	D34	8Q		
IC12	9L	Q5	10S	Q19	4O	Q32	11J	D3	13Q	D17	13P	D35	12N		
IC13	6L	Q6	10R	Q20	5M	Q33	7E	D4	13P	D20	8Q	D36	7E		



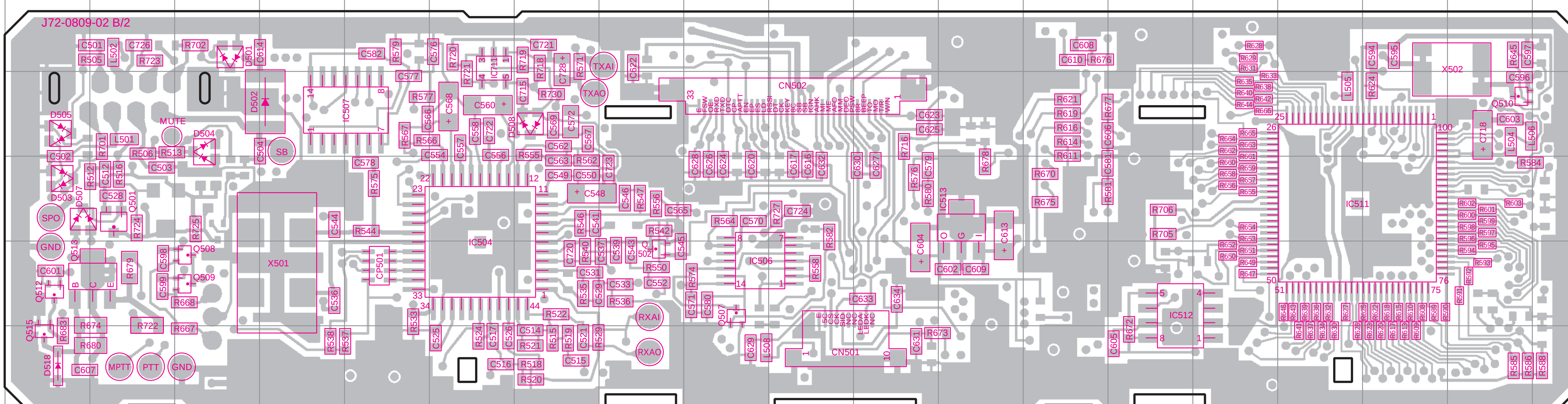
TX-RX UNIT (X57-6480-XX) (B/2) -10 : K -11 : K2 -12 : HK -13 : HK2 Component side view



Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address
IC501	2G	IC508	2L	IC710	2I	D509	3I	D512	2E	D515	5M	D520	4L
IC502	2J	IC509	4L	Q503	3H	D510	3I	D513	5E	D516	5R		
IC503	4G	IC510	3O	Q511	3C	D511	2C	D514	5I	D517	2R		

Component side
Pattern 1
Pattern 2
Pattern 3
Pattern 4
Foil side

TX-RX UNIT (X57-6480-XX) (B/2) -10 : K -11 : K2 -12 : HK -13 : HK2 Foil side view

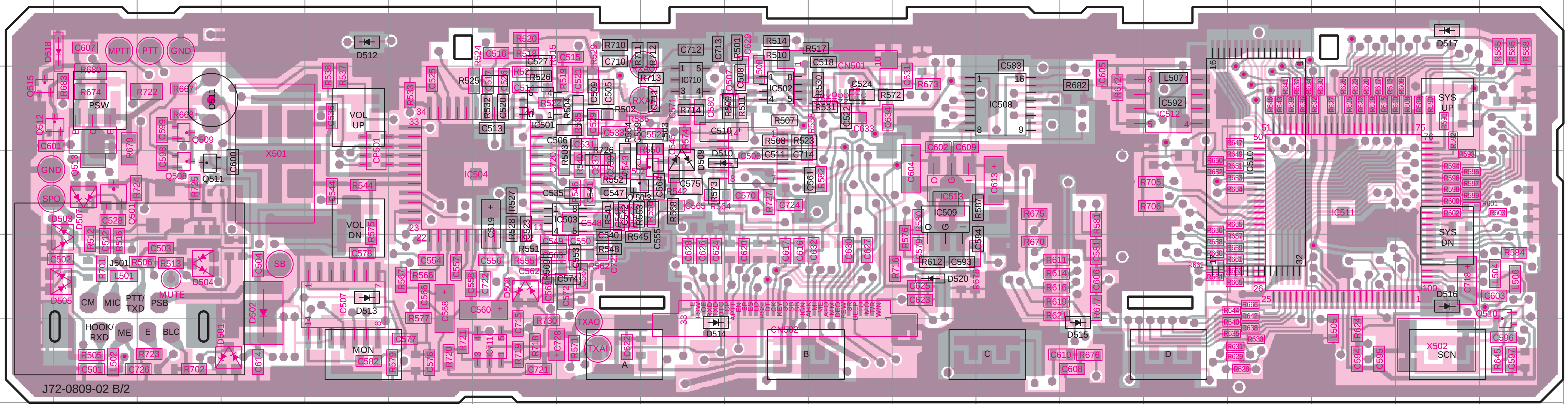


Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address
IC504	11F	IC511	10P	IC711	8F	Q507	11I	Q510	9R	Q515	12A	D503	10A	D507	10A
IC506	11I	IC512	11N	Q501	10B	Q508	11C	Q512	11A	D501	8C	D504	9C	D508	9G
IC507	9E	IC513	10L	Q502	11H	Q509	11C	Q513	11B	D502	9D	D505	9A	D518	12A

Component side
Pattern 1
Pattern 2
Pattern 3
Pattern 4
Foil side

TK-780/H PC BOARD VIEW

TX-RX UNIT (X57-6480-XX) (B/2) -10 : K -11 : K2 -12 : HK -13 : HK2 Component side view + Foil side



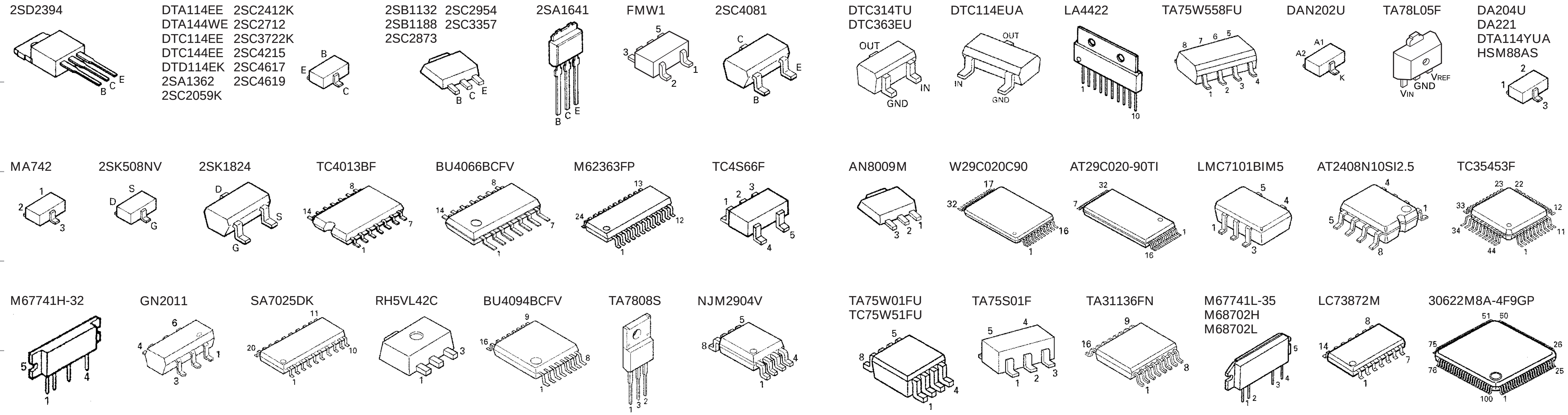
Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address
IC501	3G	IC508	3M	IC710	3I	Q508	4C	Q515	3A	D507	4B	D513	5E	D520	5L
IC502	3J	IC509	4L	IC711	6G	Q509	3C	D501	6D	D508	5G	D514	6I		
IC503	4H	IC510	4P	Q501	4B	Q510	5S	D502	5D	D509	4I	D515	6N		
IC504	4G	IC511	4Q	Q502	4I	Q511	4C	D503	5B	D510	4I	D516	5R		
IC506	4J	IC512	3O	Q503	4H	Q512	3B	D504	5C	D511	3C	D517	2R		
IC507	5E	IC513	4L	Q507	3J	Q513	3B	D505	5B	D512	2E	D518	2B		

Component side

Pattern 1
Pattern 2
Pattern 3
Pattern 4


Foil side

● Connect 1 and 4



SCHEMATIC DIAGRAM TK-780/H

Note : Components marked with a dot (·) are parts of patterun 1.



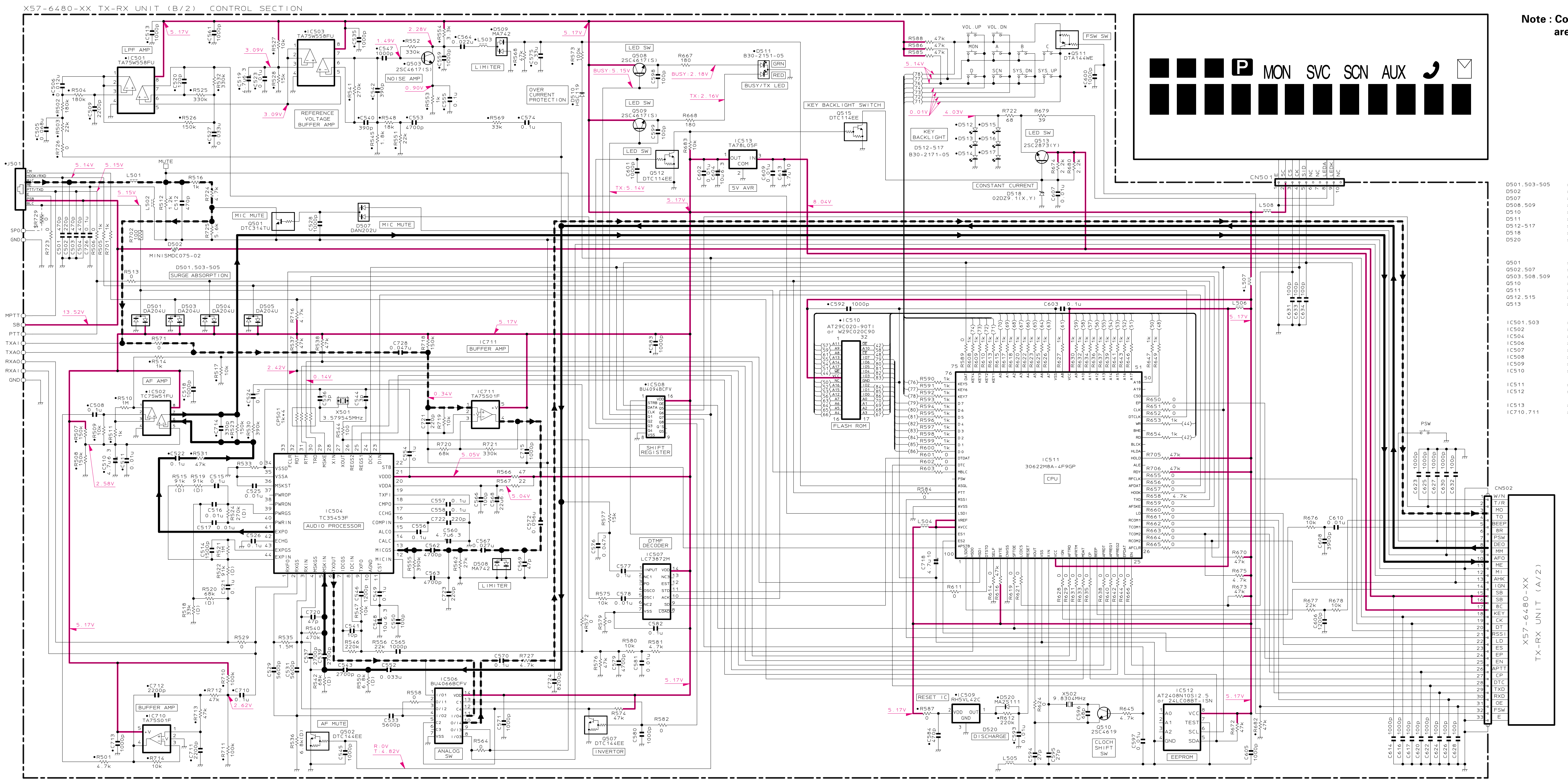
		IC400	A1	D36	Q33	TC1	TH1	VR1	L11	L202	L203	L204
-10	K	M67741H-32	X58-4712-70	NO	NO	NO	NO	100k	NO	L34-4641-05	L34-4641-05	L34-4641-05
-11	K2	M67741L-35	X58-4540-11	NO	NO	NO	NO	100k	NO	L34-4555-05	L34-4555-05	L34-4555-05
-12	HK	M68702H	X58-4712-70	DA221	2SC2712(Y)	10p	100k	100k	L92-0140-05	L34-4641-05	L34-4641-05	L34-4641-05
-13	HK2	M68702L	X58-4540-11	DA221	2SC2712(Y)	NO	100k	50k	L92-0140-05	L34-4555-05	L34-4555-05	L34-4555-05

		L205	L212	L215	L217	L218	L219	L221	L222	L223	L224	L228	R96	R127	R139	R147	R149	R173	R175	R180	R213	R241	R249	R250	R251	R252	R402
-10	K	NO	56n	5T	5T	5T	39n	27n	68n	47n	NO	15n	180	10k	0	56k	18k	180	NO	NO	15	1k	NO	0	NO	NO	22k
-11	K2	NO	68n	5T	5T	5T	56n	39n	82n	82n	NO	NO	270	10k	0	56k	18k	270	NO	0	22	NO	1k	10	1k	10	12k
-12	HK	47n	68n	4T	4T	4T	39n	27n	68n	47n	47n	NO	180	1.5k	NO	33k	18k	180	150	0	15	NO	470	12	470	NO	8.2k
-13	HK2	NO	56n	5T	5T	5T	56n	39n	82n	82n	NO	NO	270	1.5k	NO	56k	22k	270	180	0	22	NO	470	12	470	NO	8.2k

		C110	C139	C141	C145	C146	C149	C171	C172	C200	C202	C209	C242	C244	C250	C251	C252	C254	C256	C257	C259	C265	C275	C276	C283	C284	C285
-10	K	NO	3p(B)	470p	470p	470p	2p(B)	NO	NO	NO	2p	0.01u	18p	NO	47u25	8p	3p	24p	6p	24p	15p	22p	NO	NO	6p	1.5p	6p
-11	K2	10u16	2p(B)	0.01u	0.01u	470p	1p(B)	NO	NO	NO	NO	680p	22p	4p	47u25	12p	12p	27p	2p	27p	24p	27p	NO	NO	NO	NO	NO
-12	HK	NO	3p(B)	470p	470p	470p	2p(B)	0.01u	0.01u	NO	NO	0.01u	22p	4p	NO	12p	6p	22p	8p	24p	24p	24p	47u35	9p	NO	NO	NO
-13	HK2	NO	2p(B)	0.01u	0.01u	NO	1p(B)	0.01u	0.01u	10u16	NO	680p	22p	NO	NO	15p	12p	27p	NO	27p	24p	27p	47u35	NO	NO	NO	NO

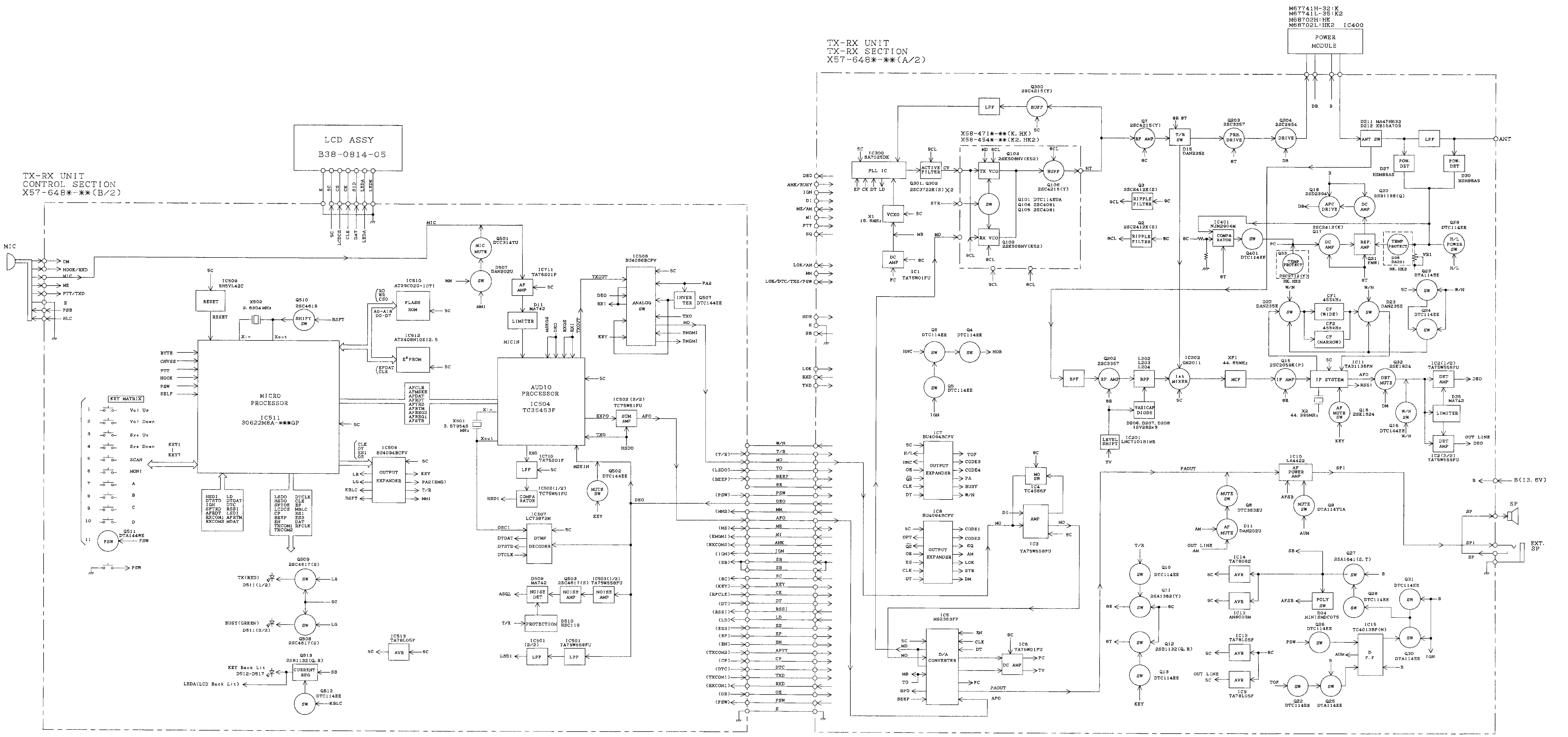
TK-780/H SCHEMATIC DIAGRAM

Note : Components marked with a dot (·) are parts of patterun 1.



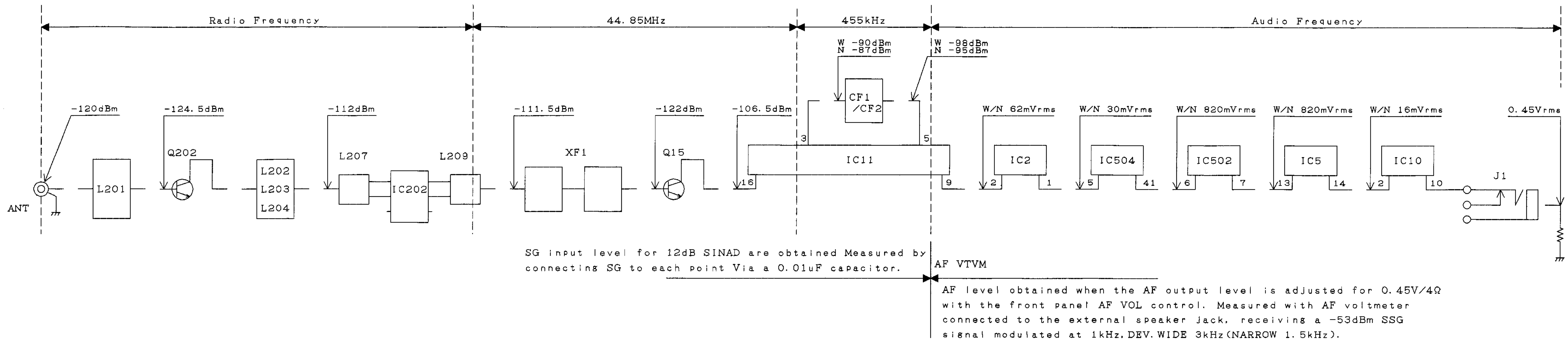
D501,503-505	:DA204U
D502	:MINISMDC075-02
D507	:DAN202U
D508,509	:MA742
D510	:HSC119
D511	:B30-2151-05
D512-517	:B30-2171-05
D518	:02DZ9.1(X,Y)
D520	:MA2S111
Q501	:DTC314TU
Q502,507	:DTC144EE
Q503,508,509	:2SC4617(S)
Q510	:2SC4619
Q511	:DTA144WE
Q512,515	:DTC114EE
Q513	:2SC2873(Y)
IC501,503	:TA75W558FU
IC502	:TC75W51FU
IC504	:TC35453F
IC506	:BU4066BCFV
IC507	:LC73872M
IC508	:BU4094BCFV
IC509	:RH5VL42C
IC510	:AT29C020-90TI or W29C020C90
IC511	:30622M8A-4F9GP
IC512	:AT2408N10SI2.5 or 24LC08BT-ISN
IC513	:TA78L05F
IC710,711	:TA75S01F

BLOCK DIAGRAM

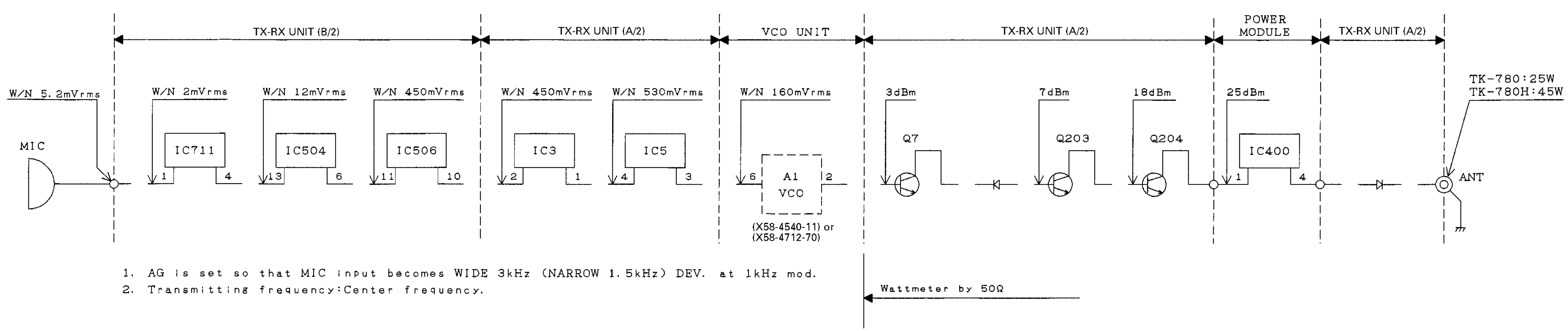


LEVEL DIAGRAM

Receiver Section



Transmitter Section



TERMINAL FUNCTION

CN7 (TX-RX Unit A/2) ⟷ CN502 (TX-RX Unit B/2)

Pin No.	Name	Function
1	W/N	Wide/Narrow switch input. H : Wide
2	T/R	TX/RX switch input. H : Receive
3	MO	Modulation signal input.
4	TO	Low speed data signal input.
5	BEEP	Beep input.
6	8R	NC (8V)
7	PSW	Power switch.
8	DEO	Receive signal output.
9	MM	MIC mute. H : MIC mute
10	AFO	Receive signal input.
11	ME	MIC ground.
12	MI	Internal MIC output.
13	AHK	Hook signal output. H : Off hook
14	IGN	Ignition output.
15	SB	13.6V output.
16	SB	13.6V output.
17	8C	8V output.
18	KEY	TX/Lock detection input.
19	CK	Shift register clock input.
20	DT	PLL/Shift register/DA converter input.
21	RSSI	RSSI signal output.
22	LD	PLL unlock detection output.
23	ES	Shift register enable input.
24	EP	PLL enable signal input.
25	EN	DA converter enable signal input.
26	APTT	PTT signal output.
27	CP	PLL clock.
28	DTC	Data control signal output.
29	TXD	Serial data
30	RXD	Serial data.
31	OE	Serial data.
32	FSW	Foot switch output.
33	E	Ground.

CN101 (VCO) ⟷ TX-RX Unit (A/2)

Pin No.	Name	Function
1	ST	Switched transmit input. H : Transmit
2	HT	Signal output.
3	E	Ground.
4	9CL	9V input.
5	8CL	8V input.
6	MD	Modulation output.
7	CV	Control voltage input.

CN501 (TX-RX Unit B/2)

Pin No.	Name	Function
1	E	Ground.
2	5C	Logic power (5V).
3	CS	Chip selector signal. L : Option
4	CK	Serial clock signal.
5	SID	Serial data input.
6	(NC)	Unused terminal.
7	(NC)	Unused terminal.
8	LED(A)	LED anode terminal.
9	LED(K)	LED cathode terminal.
10	NC	Unused terminal.

J501 (TX-RX Unit B/2)

Pin No.	Name	Function
1	BLC	MIC backlight control.
2	PSB	13.6V.
3	E	Ground.
4	PTT/TXD	PTT.
5	ME	MIC ground.
6	MIC	MIC signal input.
7	HOOK/RXD	Hook detection
8	CM	MIC data detection.

SPECIFICATIONS

GENERAL

Frequency Range	K,HK : 146 to 174MHz K2,HK2 : 136 to 162MHz
Number of Channels	Maximum 600 channels (LTR model), Maximum 250 channels (Conventional model)
Channel Spacing	Wide : 25/30kHz, Narrow : 12.5/15kHz (PLL channel step 2.5, 5, 6.25, 7.5kHz)
Input Voltage	13.6V DC negative ground
Current Drain	0.4A on standby 1.0A on receive TK-780 : 8A on transmit TK-780H : 12A on transmit
Temperature Range	–30°C to +60°C (–22°F to +140°F)
Dimensions & Weight	TK-780 : 140 (5.51) W x 40 (1.58) H x 145 (5.73) D mm (inch), 0.94kg (2.07 lbs) TK-780H : 140 (5.51) W x 40 (1.58) H x 173 (6.84) D mm (inch), 1.05kg (2.31 lbs)

RECEIVER (Measurements made per EIA standard EIA/TIA-204-D)

RF Input Impedance	50Ω
Sensitivity (EIA 12dB SINAD)	0.25µV
Selectivity	Wide : 80dB Narrow : 70dB
Intermodulation	Wide : 75dB Narrow : 65dB
Spurious and Image Rejection	90dB
Audio Power Output	4W at 4Ω less than 5% distortion
Frequency Stability	±2.5ppm from –30°C to +60°C
Channel Frequency Spread	K,HK : 28MHz K2,HK2 : 26MHz

TRANSMITTER (Measurements made per EIA standard EIA-152-C)

RF Power Output	TK-780 : 25W TK-780H : 45W
Spurious and Harmonics	70dB
Modulation	Wide : 16K0F3E Narrow : 11K0F3E
FM Noise	Wide : 50dB Narrow : 45dB
Microphone Impedance	600Ω
Audio Distortion	Wide : Less than 3% Narrow : Less than 5%
Frequency Stability	±2.5ppm from –30°C to +60°C
Channel Frequency Spread	K,HK : 28MHz K2,HK2 : 26MHz

Specifications are for K (U.S.A) models only.

TK-780/H

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